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The
WORLD UNIVERSITY ENCYCLOPEDIA
Unabridged

Volume 2

AUK–CARAVAN

AN ILLUSTRATED TREASURY OF KNOWLEDGE

Publishers Company, Inc.
Washington, D.C.

Key to Pronunciation

VOWELS

ă (short), as in *hat, cat.*
ā (long), as in *ale, hate.*
ä (Italian), as in *car, mar.*
ȧ (short Italian), as in *fast, class.*
a̤ (broad), as in *all, fall.*
â (circumflex), as in *care, snare.*
ạ or *a̦* (short obscure), as in *final, spinal.*
ȃ (long obscure), as in *surface.*
ae, as in *Caesar,* = ē.

ĕ (short), as in *net, met.*
ē (long), as in *me, eve.*
ê (circumflex = â), as in *there.*
ẽ (tilde), as in *her.*
ę or *ȩ* (short obscure), as in *patent.*
ȇ (long obscure), as in *delay.*
ė = ĭ, as in *pretty.*

ĭ (short), as in *hit, bit.*
ī (long), as in *kite, mite.*
ĩ (tilde), as in *sir.*
ị (short obscure), as in *habit.*
ȋ (long obscure), as in *idea.*

ŏ (short), as in *pop, hop.*
ō (long), as in *cone, bone.*
ô (circumflex = a̤), as in *for.*
ȏ (long obscure), as in *hero.*
o͝o (short), as in *book, brook.*
o͞o (long), as in *moon, spoon.*
ọ = û, as in *word.*
ȯ = ŭ, as in *son.*
oe, as in *Phoebe,* = ē.

ŭ (short), as in *rut, cut.*
ū (long), as in *muse, fuse.*
û (circumflex), as in *turn, urn.*
ȗ (long obscure), as in *unite.*

w is a vowel only after a vowel, when it forms the second element of certain diphthongs, as in *few, how.*

y̆ (short) = ĭ, as in *hymn.*
ȳ (long) = ī, as in *by, cry.*

CONSONANTS

ϵ (hard) = k, as in *cat, cape.*
ç (cedilla) = s, as in *cell, façade.*
ḡ (hard), as in *dog, gave.*
ġ (soft), as in *gem, gentle.*
ķ for the German ch, as in *ich, Bach* (bäk); also = ϵ

ü for the German ü, as in *Blücher, Grünberg.*
ö for the German ö, as in *Göttingen.*
ṉ for the French n, as in *bon, Bréton* (*brȃ-tôṉ'*).
th (soft), as in *path.*
TH (hard), as in *the, father.*
ñ for the sound of ny, as in *canyon.*

S.C.E.R.T., West Bengal
Date ....
Acc No..............
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Auk (*a̤k*), the name of several sea birds, including a large number of species, of which the great auk and the little auk are the best known. The great auk is about 3 ft. high when sitting in an upright position. It has short wings, which are almost useless in flight, but they aid the bird to move with great rapidity in the water. At present it is found only in North America, but bones discovered in Denmark and other regions of Europe indicate that it was formerly common to Western Europe. The little auk is about the size of a large pigeon, and is met with in great numbers in the Arctic seas, where it nests in crevices of the bare rocks. The razorbill is allied to the auk, and like the little auk frequents the crannies of rocks. The young razorbills feed from the crop of the parents even after they are able to move about quite freely. Auks yield feathers of much value for bedding, for which purpose they are hunted with considerable persistency, while their flesh and eggs are eaten by the Eskimos and other peoples of northern regions. These birds migrate in early winter from the land to the open sea, where they float on the water or perch on the drifting ice.

Aurelian (*a̤-rē'lĭ-ạn*), in Latin, LUCIUS DOMITIUS AURELIANUS, Roman emperor, born in Pannonia, *ca.* 212; assassinated on an expedition against the Persians in 275. Of humble parentage, he distinguished himself in the army and rose to the highest rank. When Emperor Claudius II died, Aurelian was proclaimed emperor with the endorsement of his soldiers. During his reign (270-275), he waged successful campaigns against the Goths and the Alemanni and other Germanic tribes, thus driving the barbarians out of Italy and securing Roman frontiers at the Danube and the Rhine. He also defeated Zenobia (*q.v.*), the queen of Palmyra, who had been extending her power in the Middle East, and crushed two pretenders whose claims weakened the unity of the Roman empire. Characterized as a harsh but just administrator, Aurelian introduced monetary and social reforms and instituted noteworthy public works. He was given the title "Restorer of the Empire" by the senate. Aurelian was assassinated by discontented army officers and was succeeded by Marcus Claudius Tacitus.

Aurelius (*a̤-rē'lĭ-ŭs*), in Latin, MARCUS AURELIUS ANTONINUS (known as MARCUS AURELIUS), Roman emperor and philosopher, born in 121; died on March 17, 180. Considered the culmination and flower of Stoicism, the noblest of all pagans, he was the adopted son and the son-in-law of Antoninus Pius, whom he succeeded on the throne in 161. At the early age of 17 he gained the favor of Emperor Hadrian. He was a pupil of Sextus, of the orator Herodes Atticus, and of Mecianus, an eminent jurist, through whom he formed the acquaintance of many learned men, and became an advocate of Stoic philosophy. He distinguished himself as sole commander of the army as early as 169, in which capacity he prosecuted with great vigor successive campaigns against the German tribes, and finally compelled them to sue for peace. Subsequently he conducted effective warfare in Asia, and, while in the East, visited Egypt and Northern Africa, and before returning home made an extended visit to Greece. On reaching Rome he was again compelled to take the field against new invasions of the savage Marcomanni and defeated the enemy several times, but was taken sick and died at Vindobona, now the city of Vienna. Although he possessed great liberality, a wide knowledge of philosophy, and magnanimity of character, he persecuted the Christians; not that he desired to suppress their worship, but rather that he feared their doctrines would hinder good government, and thought them enemies of the empire. His only extant work is one written in Greek, called "Meditations." This work has been translated into most modern languages and has had a wide circulation.

Aureomycin (*a̤-rê-ô-mī'sĭn*), an antibiotic obtained from the mold *Streptomyces aureofaciens.* In purified form, it consists of golden-yellow crystals, which are used in the treatment of viral and rickettsial diseases, such as *lymphogranuloma venereum,* "virus pneumonia," spotted fever, typhus fever, scrub typhus fever, and "Q fever." Aureomycin is more effective against gram-positive organisms than gram-negative types. Its toxicity is of low order.

Auricle (*a̤'rĭ-k'l*), in physiology, 1) the flap or external part of the ear, that part of the ear not contained within the head; 2) term applied to the two chambers at the apex of the heart on either side above the ventricles (driving chambers or pumping parts). The *left auricle* is the chamber receiving the blood from the lungs, and the *right auricle* receives the blood from the systemic (general) circulation; also called *Atrium.* See *Blood Pressure; Heart.*

Aurignacian (*a̤-rĭ-nyā'shŭn*), a cultural stage of the late Palaeolithic Period as evinced by the discoveries (1852) of implements and ornaments in the caves at Aurignac, France. These remains show a scale of development not unlike that of Cro-Magnon (*q.v.*) culture. To this period belong needles of bone, knives, and the "Venus of Willendorf," a stone statue, first known sculpture of man. See *Pre-History.*

Aurora (*ô-rōr'a̤*), a city in northeastern Illinois, in Kane County, on the Fox River, 35 m. w. of Chicago, served by the Chicago, Burlington & Quincy and other railroads. It is the seat of Aurora Coll.; Fabyan Forest Preserve is nearby. Aurora's industries include printing and publishing and the manufacture of rubber, plastics, furniture, apparel, paper products, primary and fabricated metals, chemicals, transportation equipment, electrical and other machinery, and stone, clay, glass, and wood products. The city is part of the Chicago S.M.S.A. and in 1958 had a value added by manufacture of $78,000,000. Settled in 1834, Aurora was incorporated in 1837. Population, 1950, 50,576; in 1960, 63,715.

Aurora, in Roman mythology, the goddess of Dawn; to the Greeks she was the "rosy-fingered" Eos. As Eos, her parents were the Titan Hyperion and Thea. By the Titan Astraeus her children were the winds Zephyrus, Notus, and Boreas and such stars as Phosphoras. Memnon (*q.v.*) was one of her sons by Tithonus (*q.v.*), whose couch she left at dawn to be drawn out of the east in a chariot pulled by the winged horses Lampus and Phaethon. In various accounts (chiefly Homer's), she announces the sunrise, sometimes accompanying it until midday, or all day, thus becoming the goddess of daylight. Memnon's death at Troy caused her such grief that she still weeps, creating dewdrops.

Aurora Borealis (*bō-rē-ăl′ĭs*), or NORTHERN LIGHTS, a phenomenon occurring in the upper atmosphere in the Northern Hemisphere that corresponds to the *aurora australis* in the Southern Hemisphere. Auroras appear as colored forms in the sky whose shapes and brightness constantly change. Reds and greens predominate. Generally, an auroral display begins with an arc of light in the northern sky, after sunset, which breaks up into parallel "rays" which grow brighter and dance through the sky. Finally, pulsating sheets of color may appear, and at the end of the display a faint arc often returns. Auroras occur as a result of the interactions of streams of charged particles, emitted by the sun, with the oxygen and nitrogen of the atmosphere 50-100 m. above the earth. Auroras are most frequent in the *auroral zones,* regions centered about the geomagnetic poles and 20° or so of latitude away from them. They take place with diminishing frequency north and south of these zones and occur only rarely in the tropics. Intense auroras are often accompanied by magnetic storms and by changes in the ionosphere which affect short-wave radio communications.

Aurungzebe (*ạ-rŭng-zēb′*), the last emperor of the Mogul dynasty in Hindustan, born Oct. 20, 1618; died Feb. 21, 1707. His father, Shah Jehan, appointed him viceroy of the Deccan, where he acquired both wealth and military power. In 1658 he usurped the throne, imprisoned his father, and soon after treacherously put to death his brothers and their male descendants. He then assumed imperial power, imprisoned his political opponents, and extended the dominion until it included the kingdoms of Bijapur and Golconda. He assumed the title of Alangir, meaning Conqueror of the World. He is regarded as one of the most powerful rulers of Hindustan, but his continual wars weakened his country.

ROCKY GORGE OF AUSABLE CHASM

Ausable Chasm (*ạ-sā′b'l ḳăz'm*), a picturesque gorge on the Ausable River, 12 m. from Plattsburg, Clinton County, New York. The river, after a 70-ft. fall, flows 2 m. in zigzag fashion through vertical rocks of Potsdam sandstone streaked with hard quartz. In some places, the erosion is 175 ft. in depth. Ausable, a nearby resort town, had 1,903 residents in 1950.

Auscultation (*ạs-ḳŭl-tā′shŭn*), in medicine, the act of listening to the sounds within the human body, either directly by ear, or with the aid of a stethoscope. Disorders of the chest, heart, or large blood vessels may thus be recognized.

Austen (*ạs′tĕn*), JANE, novelist, born in Steventon, Hampshire, England, Dec. 16, 1775; died July 18, 1817. She was educated principally at Steventon Parsonage, where her father was rector, and lived a quiet, uneventful life, writing of middle-class English society. She is regarded as one of the foremost women novelists because of the wit and irony of her characters and her crisp, unaffected style. Among her best-known works are "Sense and Sensibility," "Pride and Prejudice," "Mansfield Park," and "Northanger Abbey."

Austerlitz (*ạs′tĕr-lĭts*), a small town in Moravia, in the central part of Czechoslovakia, 12 m.

E. of Brünn. It is celebrated as the site of Napoleon's victory over the Austrians and Russians on Dec. 2, 1805. After Napoleon occupied Vienna, he established headquarters at Brünn, to which place the allied armies advanced. The French army numbered about 80,000 and in the battle lost 12,000 men. The allied forces numbered about 84,000 and sustained a loss of nearly 30,000 men killed, wounded, or captured. This battle resulted in the Peace of Pressburg, through which a large part of Central Europe became subject to Napoleon. Austerlitz has a population of about 4,000.

Austin (*a̤s′tĭn*), a city in southern Minnesota, seat of Mower County, on the Red Cedar River, *ca.* 100 m. S. of St. Paul, served by the Chicago Great Western and the Chicago, Milwaukee, St. Paul and Pacific R.R.'s. Surrounded by fertile farm country, the city has a meat-packing plant and manufactures flour, machinery, and farm implements. The first settlement was made in 1854, and Austin was incorporated in 1873. Population, 1950, 23,100; in 1960, 27,908.

Austin, the capital of Texas, seat of Travis County, in the southeast, on the Colorado River, *ca.* 170 m. N.W. of Houston, on the Missouri Pacific, the Southern Pacific, and other railroads. Bergstrom Air Force Base is nearby. In an area producing quantities of cereals, fruit, and livestock, the city is an important market. It is the center of the Austin standard metropolitan statistical area (pop., 1960, 212,136), comprising all of Travis County, with a value added by manufacture in 1958 of $33,445,000; the figure for the city alone was $28,421,000. Industries include meat-packing and manufacture of clothing, machinery, flour, truck bodies, and farm implements. Austin is the seat of the Univ. of Texas, St. Edward's Univ., and St. Mary's Cathedral. It was named for Stephen F. Austin (*q.v.*). It became capital of the Republic of Texas in 1839 and in 1840 was made capital of Texas by the Texas congress. Population, 1900, 22,258; in 1950, 132,459; in 1960, 186,545.

Austin, ALFRED, poet, born in Headingley, near Leeds, England, May 30, 1835; died in Ashford, Kent, June 2, 1913. He was graduated from the Univ. of London in 1853 and four years later was called to the bar. He was correspondent for the London *Standard* in Rome (1870) and in Prussia during the Franco-Prussian war and became editor of the *National Review* in 1883. In 1895 he was made poet laureate of England. His critical writings (*e.g.,* "The Season") are now of rather more interest than his poetry, of which he published 20 volumes. His chief poetic works are "Songs of England," "Savonarola" (1881), "England's Darling" (1896), and "In Veronica's Garden."

Austin, JOHN, jurist, born at Creeling Mill, England, March 3, 1790; died in Weybridge, Surrey, Dec. 1, 1859. He studied law in London and was a friend of John Stuart Mill. In 1826 he was made professor of jurisprudence in the Univ. of London, where he taught with much success for six years. He is one of the most distinguished English writers on jurisprudence; his chief work is "Province of Jurisprudence Determined" (1832).

Austin, STEPHEN FULLER, pioneer, born in Wythe County, Va., Nov. 3, 1793; died in Columbia, Texas, Dec. 27, 1836. The son of Moses Austin (1761-1821), he shared his father's interest in establishing a colony in Texas, and shortly after his father's death he successfully founded a colony on the land grant his father had obtained from Mexico. While in Mexico City petitioning that Texas be made a separate Mexican state, he was imprisoned (1833). Finding Texas in revolt when he returned there, he led its army until replaced by Samuel Houston (*q.v.*). After serving on a mission to Washington, D.C., to enlist U.S. sympathy for Texas, he was defeated (1836) for the presidency of Texas by Houston, under whom he served as secretary of state.

Austin, WARREN ROBINSON, lawyer, jurist, legislator, and U.S. ambassador, born in Highgate, Vt., Nov. 12, 1877; died in Burlington, Dec. 25, 1962. He was admitted successively to the bar of Vermont (1902), the U.S. Circuit Court (1906), and the U.S. Supreme Court (1914). He entered politics as mayor of St. Albans in 1909 and served as Vermont attorney in the boundary dispute with New Hampshire. Elected to the U.S. Senate in 1931, he served for 15 years. Just before the end of his third term in 1946, Austin was appointed by President Truman

Courtesy Blackstone Studios, Inc.

WARREN R. AUSTIN

as the U.S. member of the Security Council and chief of the U.S. mission to the U.N.; he retired from these positions in 1952.

Austin, WILLIAM LANE, statistician, born in Scott County, Miss., Jan. 25, 1871; died in Greenville, Miss., Oct. 10, 1949. After graduation (1891) from Harperville Coll., he received (1898) an LL.B. degree from the Univ. of Mississippi. In 1900 he entered the Bureau of the Census as a clerk. A brilliant statistician, he progressed rapidly to divisional directorships and was director of the bureau, 1933-41. Under his guidance statistics concerning U.S. unemployment, wages, and housing first were included (1940) in the U.S. Census.

Australasia (*ạs-tràl-ā′shȧ*), a division of Oceanica, located s.w. of Asia. It comprises the continent of Australia and the islands adjacent to it. Among the chief islands of Australasia are New Zealand, Tasmania, New Caledonia, the Solomon Islands, the New Hebrides, New Britain, New Ireland, Admiralty Islands, the Arru Islands, New Guinea, and many smaller islands and island groups. It comprises the largest of the three portions of Oceanica, the other divisions being Polynesia and Malaysia. The area of Australasia is 3,259,200 sq. m., and the population is estimated at 5,275,000.

Australia (*ạs-trā′lĭ-ȧ*), COMMONWEALTH OF, the smallest continent, has an area of 2,974,581 sq. m., about equal to that of the U.S.A. and 25 times that of Great Britain. Its greatest length from east to west is 2,400 m. and its greatest width from north to south, 2,000 m. It is bounded by the South Pacific Ocean, the Southern Ocean, the Indian Ocean, and the Timor Sea.

The name, *Australia,* was first applied to the territory in the early 1800's by a British explorer, Flinders. The name was derived from *Terra Australis,* Latin term meaning south land, the name originally applied to the entire area between South Africa and South America.

PHYSICAL FEATURES. The western half of the continent consists of the Great Plateau, an ancient rock formation worn down through countless ages to a uniquely level surface, broken only by isolated weathered hills. To the east, separated from the South Pacific by a narrow coastal plain, is the Great Dividing Range, a generally rugged and heavily timbered series of mountains running the breadth of the continent. Between the eastern mountains and the western plateau is the third great division of the continent, the Central Basin, a low-lying level area which was once seabed but which has been filled with sediment carried down from adjoining highlands.

Inland, the country is dry (5 to 10 in. of rain yearly), and rivers are low and sluggish, often consisting of a series of water holes. After the infrequent rains, however, the country springs to life and becomes overgrown with endless miles of wildflowers and grasses. On the eastern coastal plains and mountain slopes, there is a belt averaging 300 m. wide, running from north to south, in which rainfall averages between 20 and 50 in., and here the bulk of the population is concentrated. The southeast, from Brisbane to Melbourne, has a mild, equable climate resembling that of California and the Mediterranean. The central area is semi-desert and the far north, tropical.

Apart from the mainland and the island state of Tasmania, Australia has extensive territorial interests consisting of the Mandated Territory of New Guinea, Papua (formerly British New Guinea), Nauru, Norfolk Island, and a large and potentially valuable section of Antarctica. These territories, in addition to the two areas on the mainland not incorporated in any state—Australian Capital Territory (the site of the national capital, Canberra), and the Northern Territory—are administered by the Australian government.

AREA AND POPULATION. The area of Australia is divided into the following states in order of their population: New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania, Capital Territory, and Northern Territory. The population, mainly of European origin, especially English, has shown a marked increase since the gold era:

Year	*Population*
1860	1,145,585
1880	2,231,531
1900	3,765,339
1920	5,411,297
1940	7,000,000
1950 (est.)	8,045,000

The relatively sparse population of Australia is shown by the fact that its 8,045,000 men, women and children, about the population of New York City, are spread over an area of nearly 3,000,000 sq. m., equal to the size of the U.S. The bulk of the population is concentrated in the capital cities. In June 1947 the population of these were:

Sydney	1,484,004
Melbourne	1,226,409
Brisbane	402,030
Adelaide	382,454
Perth	272,528
Hobart	76,534

Thus 49 per cent of the population is concentrated in six cities and their suburbs. It is authoritatively estimated that Australia could comfortably support a population of 20,000,000.

ABORIGINES. When the white settlement of Australia began in 1788 the continent was sparsely inhabited by semi-nomadic bands of chocolate-brown natives who wore no clothes, erected no permanent dwellings, had not learned gardening, lacked domestic animals, could not make pottery and possessed weapons and implements made only of wood or stone—truly a Stone Age people. Calculations put their number then at 300,000. Today there are only 47,000 full-blooded aborigines, and the number is decreasing.

In their own surroundings, in the center and north, the aborigines are exceptional hunters, trackers, and food-gatherers and can sustain themselves where the white man would starve. In the white man's environment they make excellent cowboys, laborers, and mechanics, and are invaluable to police as trackers.

The aborigines average about 5 ft. 6 in., have wavy to curly black hair, low foreheads, very broad noses, and slender hands and legs. In appearance they are distinct from all other Negroid races and fall into a separate division called Australoid.

PASTORAL INDUSTRIES. Australia's livestock, on Dec. 31, 1949, when the human population was just over 8,000,000 people, totaled: 108,735,432 sheep, 14,123,610 cattle, 1,697,845 horses, and 1,196,322 pigs. The main pastoral industry is sheep-raising for wool and mutton; the nation's vast flocks produce one-quarter of the world's wool requirements.

MEAT PRODUCTION

(*includes weight of bone*)

YEAR	Beef	Veal	Mutton	Lamb	Pork	Bacon	*Total in terms of fresh meat*
(*Thousand Tons*)							
Aver. 1934–39 ..	485	46	201	114	38	33	934
Aver. 1939–44 ..	483	36	235	144	47	42	1,009
1948-49	515	57	173	138	35	40	971

Production of wool has become a tremendous industry with a huge capital investment. The flocks, which have been carefully bred to produce fine wools, are descended from imported Spanish Merinos, Negrette Merinos from Germany, animals of the famous Rambouillet strain from France, Vermonts from the U.S., and the best of the English Leicester, Corriedale, and "Down" types. A total of 19,000,000 sheep and lambs are slaughtered each year for meat.

Dairying is largely confined to the relatively well-watered coastal areas. Estimated net value of dairy production amounted to about $195,500,000 for 1947-48.

Horse-breeding is the third section of the pastoral industry and animals valued at approximately $73,000 were exported in 1947-48.

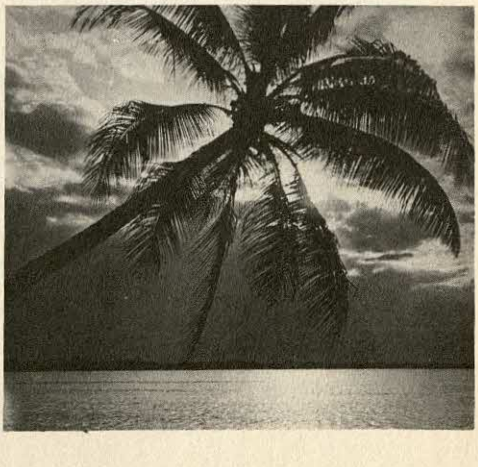
AGRICULTURE. So-called "dry-farming" methods to conserve surface moisture, breeding of drought- and rust-resisting plants, and scientific fertilizing have enabled Australian farmers to extend wheat-growing to dry areas earlier believed barren. Estimates of Australia's 1949-50 wheat crop pointed to a harvest of 216,500,000 bushels from a planting of 12,500,000 acres. In the five years before World War II the average production was 154,325,000 bushels. Because of low domestic consumption, an average surplus of 110,000,000 bushels yearly was available before the war for sale overseas, making Australia one of the biggest grain exporters on the world market. The exchangeable surplus for 1949-50 was estimated to be 140,200,000 bushels.

Other major crops include sugar, which in 1949 was valued at about $79,700,000, from 383,501 acres producing 953,000 tons of sugar. The sugar industry makes possible the large-scale canning of fruit. Australian canned fruits and vegetables now reach markets in all parts of the world.

All types of fruit are produced in abundance, ranging from pawpaws and pineapples in tropical Queensland to apples in Tasmania. Increasing quantities of rice, tobacco, hops, cotton, peanuts, and other oil and fiber crops are under cultivation.

MANUFACTURING. The two World Wars, by cutting off imports from Britain and America and forcing domestic production of war materials, accelerated the process of Australia's industrialization. The Commonwealth now has a factory system capable of producing its own automobiles, trucks, railway equipment, radio and electrical goods, airplanes, all domestic machinery and lighter machine tools, and rubber goods. During World War II, substantial quantities of steel products and armaments were shipped to Asiatic allies and to Britain. In 1947 Australia's 34,768 factories, employing 804,929 workers, had a total output of $3,265,000,000. Heavy industries are concentrated chiefly at Newcastle and Port Kembla (N.S.W.), where convenient coal and water transportation have led to the establishment of large-scale steel works and allied industries. Factories for the production of consumers' goods are grouped mainly around the capital cities of each state.

VIEW ON GREAT BARRIER REEF, QUEENSLAND



AUSTRALIA'S LARGEST HARBOR

Sydney, capital of New South Wales, situated on the harbor of Port Jackson, is the principal port of the continent, capable of accommodating the world's largest vessels. The Sydney Harbor Bridge (*in the foreground*) is the largest arch bridge in the world

MINING. Gold produced throughout Australia at the end of 1938 was valued at $2,796,000,000 and total mineral production to that date was $5,548,000,000. Production of gold declined during the war because manpower was transferred to the mining of other ores and metals. Gold is still one of the most valuable Australian minerals. Over 900,000 fine ounces were mined during the year ending June 1949, valued at $32,700,000. Other important minerals are coal (mostly from New South Wales and Victoria), and lead and silver (approximately $68,100,000 worth was mined in 1948). Copper mined in 1948 was valued at about $5,500,000, and tin at $3,200,000. Iron ore, zinc, and small but important quantities of mica and tungsten are also produced. Notable also is the opal mining, including the unique "black opal" gouged from the barren fields of Coober Pedy, in western New South Wales.

OVERSEAS TRADE. Australia lives by her exports, which consist principally of wool, meat, dairy products, fruits, flour, and wheat. The largest customer is Great Britain. The volume and direction of Australian imports are regulated by the Customs Tariff which protects Australian industry, produces revenue, and applies the principle of Empire Preference.

RELIGION. The principal religions of Australia, in order of their numerical strength, are Church of England, Roman Catholic, Presbyterian, Methodist, and Baptist. All denominations are permitted to preach their creeds without restriction.

LANGUAGE. English is the predominant spoken and written language.

EDUCATION. Primary education is compulsory and is provided free by the states for children between the ages of 6 and 14, and in some states to 15. The state education system also provides for free secondary education in high and technical (trade) schools. Agricultural colleges are provided by each state to give instruction in all branches of modern farming. At the top of the education system of each state is a university located in each capital city.

In addition to the state education system there are the public schools of the traditional British type. These are privately owned and provide primary and secondary education at moderate cost. Church schools play a major role in education in Australia.

RAILWAYS. These have been the principal agent in the development of Australia. With few exceptions, all are state-owned and are operated without profit. There are about 28,000 m. of rail-

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CHARACTERISTIC FOLIAGE OF SOUTH AUSTRALIA

AXMAN AT WORK ON A EUCALYPTUS TREE

way in operation, principally around the coastal rim of the continent, with large trunk lines branching inland at infrequent intervals. Australian railways carry an average yearly total of about 500,000,000 passengers. At the time when railways were introduced into Australia (the latter half of the 19th century), each state constructed its railway tracks according to its own ideas of what the ideal gauge should be. Consequently New South Wales uses the 4 ft. 8½ in. gauge, Victoria 5 ft. 3 in., and Queensland, Western Australia, South Australia, and Tasmania 3 ft. 6 in. The change of track gauge at state borders entails delay in interstate travel, but extensions of one state system into another state enable uninterrupted travel between Sydney and Brisbane, and between Melbourne and Adelaide. Agreement on standardization of gauges has been reached between the Commonwealth, New South Wales, and Victoria.

Flora and Fauna. Australia, cut off for countless centuries from the Asiatic mainland, has retained a highly distinctive plant and animal life. Most curious of the animals are the marsupials, such as the kangaroo and its smaller cousin the wallaby, the opossum, and the koala bear. The kangaroo is the quaint creature that jumps when it walks and carries its young in a pouch or pocket of fur on its belly. At full growth, the male kangaroo attains a height of 6 to 7 ft., has two powerful hind legs and sturdy tail, tiny forepaws, and a head shaped like a deer's. It covers

CATTLE BREEDING—A MAJOR INDUSTRY

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up to 20 ft. at a leap and attains a speed of over 40 m. an hour. Kangaroos are found throughout Australia and their numbers are controlled by government enforcement of open and closed hunting seasons. Almost as well known as the kangaroo is the lovable koala bear, the living pattern of the child's toy teddy-bear. They grow to a length of about 26 in., have comical blunt noses that seem to be made of artificial leather, large rounded ears, and thick fur. They are awkward in appearance and when frightened or distressed cry real tears and whimper like a child.

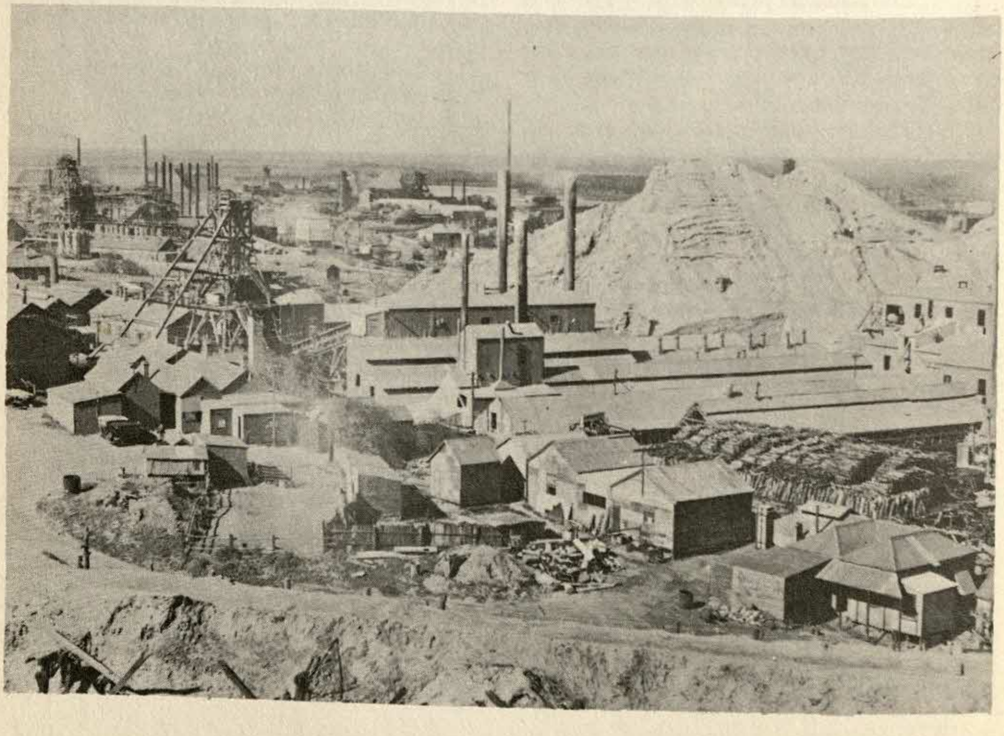
Even more interesting to the anthropologist is the platypus, a curious animal judged by the standards of the rest of the world. When first discovered it presented a great problem in accurate classification because it seemed to be part bird, part mammal, and part fish. It has a thick furry body up to 18 in. long, and a 6-in. tail, like that of a beaver. It has a duck bill and webbed feet but the toes all terminate in claws. The female lays eggs like a bird but when the young are hatched she suckles them like a mammal. The platypus is completely amphibious, making its home in the banks of streams. The platypus is one of the monotremes, the lowest order of mammals. It shares this classification with the Australian ant-eaters, popularly known as "porcupines" because their bodies are covered with spiny quills.

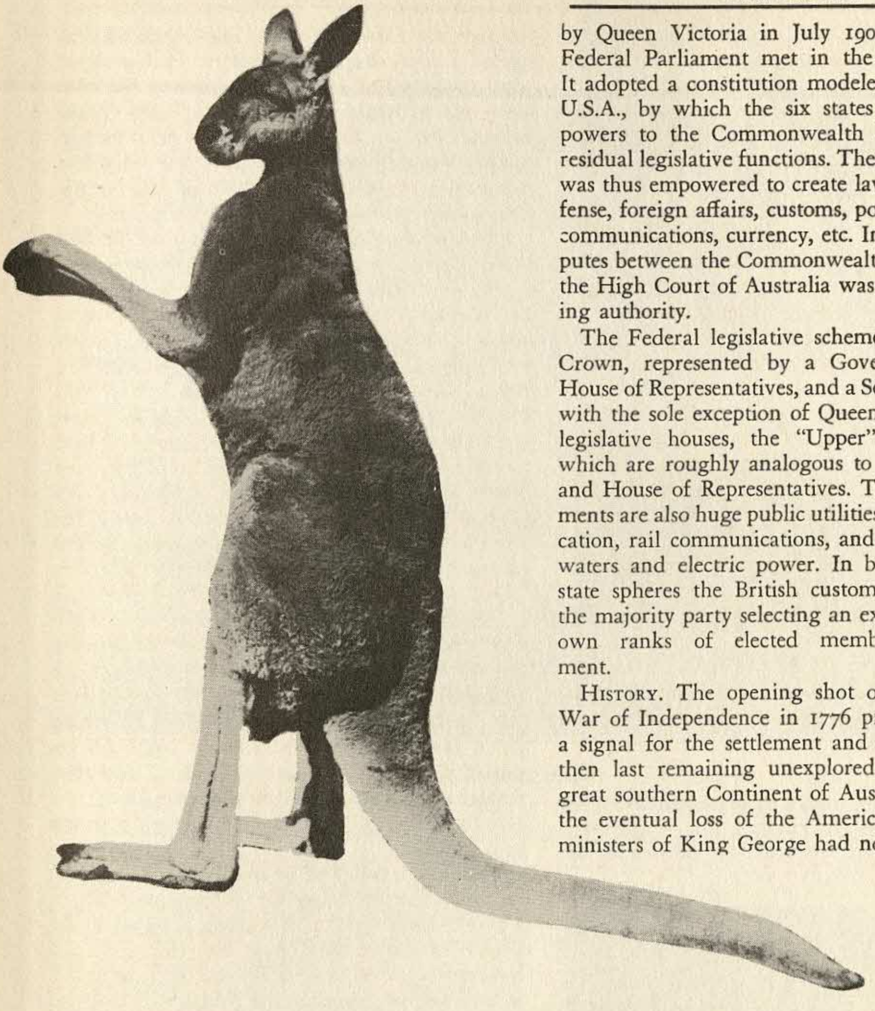
Of the Australian birds, the emu is the best known. It is the second largest bird in the world, standing next to the ostrich, which it generally resembles. It does not fly, having only rudimentary wings, stands 6 ft. tall upon powerful legs, and can run with great speed. Other notable birds are the kookaburra, or "laughing jackass," and the lyre-bird. The kookaburra has no song but his voice produces a medley of raucous sounds strongly resembling human laughter. At dawn and sundown the kookaburras "laugh" in chorus, providing a sound that can be heard in no other part of the world. The lyre-bird gets its name from the two large tail feathers of the male which are shaped like the frame of a lyre. This bird is noted as a mimic of tremendous talent and can render with startling exactness the songs of all other birds plus the sound of axmen at work, the whirr of the circular saw, the barking of dogs and even the blaring note of the automobile horn. The male lyre-bird when courting dances before his mate, using mincing steps and a whole series of bowings. Lyre-birds are found along the eastern seacoast, from Victoria to Queensland.

Of the Australian flora, the outstanding feature is the evergreen eucalypt tree. It occurs in

"THE GOLDEN MILE," KALGOORLIE, WESTERN AUSTRALIA

These mines have been producing gold since 1893





"OLD MAN" KANGAROO

The kangaroo is the national animal of Australia and is preserved from game hunters except in those districts where they eat too much of the pastures

more than 360 species, ranging from the tall straight "gum tree," 300 ft. high, to the stunted twisted mallee tree. The eucalypts are hardwoods and many varieties are valuable sources of timber for fencing, marine piles, and heavy construction work. In some Australian cities the eucalypt timber is cut into rectangular blocks for surfacing roads, in the style of the old European cobblestones.

Government. Australia is one of the entirely free, independent, and self-governing units of the British Commonwealth of Nations. The Australian Commonwealth Government was constituted by an Act of the British Parliament assented to by Queen Victoria in July 1901, and the first Federal Parliament met in the following year. It adopted a constitution modeled on that of the U.S.A., by which the six states yielded specific powers to the Commonwealth but retained all residual legislative functions. The Commonwealth was thus empowered to create laws regarding defense, foreign affairs, customs, post and telegraph communications, currency, etc. In the case of disputes between the Commonwealth and the states, the High Court of Australia was to be the deciding authority.

The Federal legislative scheme consists of the Crown, represented by a Governor-General, a House of Representatives, and a Senate. The states, with the sole exception of Queensland, have two legislative houses, the "Upper" and "Lower," which are roughly analogous to the U.S. Senate and House of Representatives. The state governments are also huge public utilities, providing education, rail communications, and often irrigation waters and electric power. In both federal and state spheres the British custom is followed of the majority party selecting an executive from its own ranks of elected members of Parliament.

History. The opening shot of the American War of Independence in 1776 proved also to be a signal for the settlement and conquest of the then last remaining unexplored land-mass—the great southern Continent of Australia. For, with the eventual loss of the American colonies, the ministers of King George had no way to accommodate the thousands of political and criminal prisoners who had previously been shipped to American penal settlements. Within two years after the British army evacuated the thirteen colonies, British jails were packed to capacity and the overflow was being crammed into hulks anchored offshore. In these circumstances, the British Government turned its attention to the new territories of Australia, the coasts of which had been explored and charted in 1770 by Capt. James Cook, accompanied by a scientific party sent out by the Royal Society to make observations in the Southwest Pacific. Their reports aroused considerable interest in London but did not immediately prompt the British Government to accept the responsibility of supporting a new colony. The prison situation was becoming desperate by 1785, however, and the following year the government authorized formation of a fleet to transfer the first group of convicts to Eastern Australia, to the

KOALA, AUSTRALIA'S NATIVE BEAR

The koala, small-size, harmless native bear, lives in the eucalyptus forests of Australia

LYRE BIRD

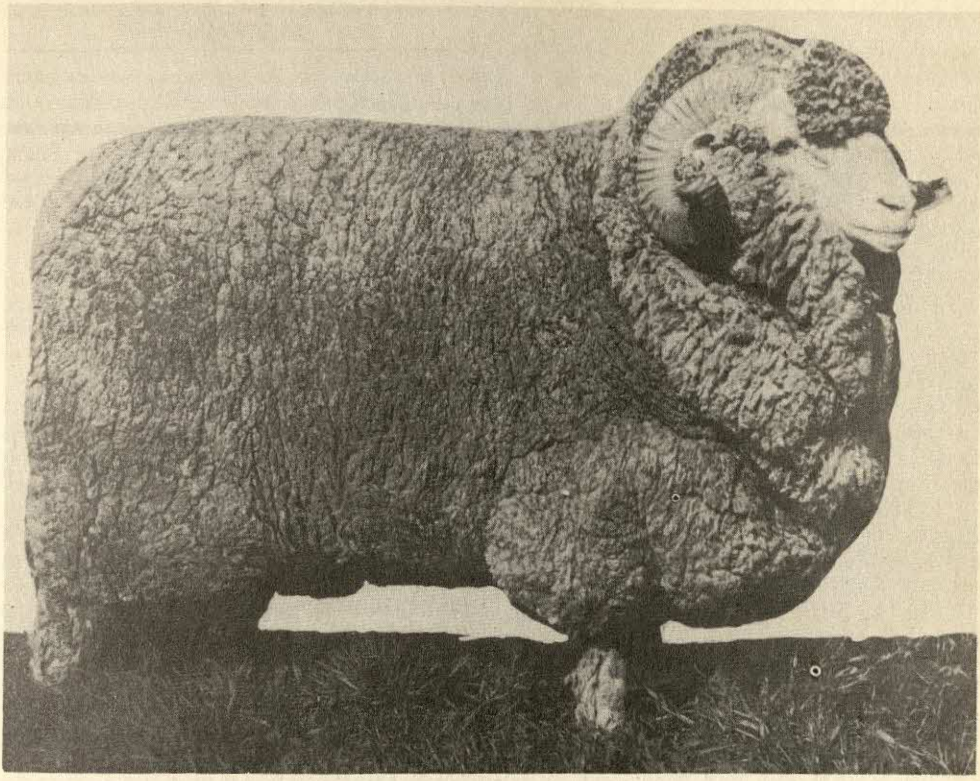
The male lyre bird, mimic of the Australian bush, includes more than 100 imitations in its repertoire. The name is derived from lyre-like plumes of the male bird

harbor that Cook, in 1770, had explored and named Botany Bay. Capt. Arthur Phillip sailed with 11 ships and 1500 men, including 800 convicts, out of British waters in May 1787. Eight months later, on Jan. 18, 1788, the fleet reached Botany Bay and on January 26th, moved a few miles up the coast to what became the permanent settlement of Sydney, on Port Jackson.

The continent on which they had settled had been known to exist since the 17th century, but its presence had been suspected by geographers for many hundreds of years more. Ptolemy of Alexandria made a map in the second century showing a last land mass, "Terra Incognita," in the south, and it was believed from then until after the Renaissance that some mighty continent must exist to counterbalance the weight of land in the northern hemisphere and thus keep the world "in a state of equilibrium." The great voyages of the Portuguese and Spanish traders in the 16th and 17th centuries almost located the unknown southland but were a little too far north. The Dutch followed, but had the misfortune to touch only on the more arid areas of the southland. Jan Carstensz, in 1623, charted Western Cape York, at the northeastern extremity of the continent. Dirk Hartog touched the equally barren southwestern portion in 1616 and Houtman sailed along the western coast in 1619. All returned discouraging reports to Holland, and after several more unsuccessful voyages the Dutch decided to concentrate on developing their interests in the Indies.

The British followed in 1688, when a company of buccaneers including the picturesque William Dampier came south after a career of piracy in the China Sea aboard the *Cygnet.* He returned home, but wanted to see more of the southern continent, so, in 1699, he persuaded the British Admiralty to give him a ship, the *Roebuck*. He touched only upon the arid west coast and his report discouraged further British exploration until Cook, in 1770, charted the east coast, planted the British flag, and took possession in the name of the king. His report that the country held promise led directly to Captain Phillip's convict settlement of 1788.

The new colony almost perished in the first decade, due to the lack of supplies and of skilled farmers and artisans. The settlement was squeezed into a small pocket of land around Port Jackson by impassable mountains, and it was not until 1813 that a path was found westward across the Blue Mts. It was then possible for settlers to extend to the fertile plains beyond and for successive expeditions of explorers to pass through the mountain gap north, south, and into the western interior, opening the way for pioneer farmers and grazers. Settlements were established at Hobart in 1803, Brisbane in 1824, Perth in 1829, Mel-



STUD RAM

This is one of the magnificent stud rams, which at Australian sheep sales realize as much as $25,000

bourne in 1835 and Adelaide in 1836; all of which subsequently became state capitals. It was not until 1901 that these states formally banded together to form the Commonwealth of Australia, with its own new capital of Canberra.

The discovery of gold in the 19th century caused the population to grow rapidly. The first strike was made in 1851 near Bathurst, New South Wales, followed later in the same year by discovery of the rich field at Ballarat and Bendigo and, in 1892, at Coolgardie and Kalgoorlie in Western Australia. By this time, the outlines of modern Australia were beginning to emerge. The shipment of convicts had ceased by 1853, and in the next decade their numbers were swamped by the rush of free settlers to the goldfields and to the coalfields of Newcastle, New South Wales, and onto the land. The first railway was built in Melbourne in 1854 and thereafter new lines pushed out steadily from the capital cities.

War Effort. In her relatively short history, Australia has built up a military tradition of which her people are proud. In World War I, Australia was the biggest partner in the Anzac combination, the Australian and New Zealand Army Corps. In that struggle, 330,000 Australians volunteered for military service overseas, and 226,000 of this number were killed or wounded. With a population in 1914 of only about 5,000,000, Australia suffered a loss of men proportionately greater than that of the U.S.

In the Second World War, Australia was an outstanding member of the United Nations. Her troops, all volunteers, took part in the campaigns of North Africa, Crete, Greece, Syria, Malaya, New Guinea; and her airmen participated in every theater. Australians figured in the long, gallant siege of Tobruk, which played a big part in saving Egypt from the desert troops of Field Marshal Rommel. The Royal Australian Navy, expanded to meet the requirements of home defense, also cooperated with the Royal Navy and the U.S. Navy in operations in the Atlantic, Mediterranean, and Pacific. Under the stimulus of war, Australia built a large and efficient war industry, which not only produced land, sea, and aerial weapons for its own use, but supplied British and American allies in the Pacific and Far East. Under reverse lend-lease, Australia supplied the American forces in the Southwest Pacific with food, clothing, and many items of equipment and munitions.

Up to the time of the Japanese attack on Pearl Harbor, which brought war to the Pacific, Australia's role was to supply food, clothing, weapons, and war materials to the European Allies and to put a powerful expeditionary force of fully equipped troops into the European and Middle East fields. Through the Empire Air Pool, she sent pilots, air-crews, and ground-crews to Britain to swell the ranks of the R.A.F. Furthermore, elements of the Royal Australian Navy were dispatched to British and Mediterranean waters where they operated under the Royal Navy. This effort was made on a voluntary basis. The then Prime Minister, Robert G. Menzies, heading a conservative coalition government consisting of the United Australia Party (Conservatives) and the Country Party, declined to pass a Selective Service Act, on the grounds that sufficient troops were coming forward to offer their services for overseas fighting. Throughout the early stages of the war Prime Minister Menzies retained power by the risky majority of one vote in the House of Representatives. Shortly after returning to Canberra from a tour of Britain, America, and Canada, one member of his party crossed the floor of the House to vote with the Labor Party opposition on a relatively unimportant domestic question and Menzies submitted his resignation. In the subsequent election the Labor Party was returned to power under the leadership of Prime Minister John Curtin. This austere ex-journalist and trade union leader was at the helm in the anxious days following the loss of Singapore, much of New Guinea, and all the Dutch East Indies to the Japanese in 1942. He at once conceived that Australia's task was to prevent further Japanese gains and then to build up the Commonwealth into an advanced base for attack northward towards the Philippines and Singapore. In a swift series of legislative measures he placed the country on a more complete war footing than had previously been thought possible. Taxation was increased to absorb all purchasing power above that necessary to maintain health. The government was given full control of the immediate destinies of all citizens, male and female. It set up a manpower commission to move workers into essential industries or into the army. Race-tracks were closed and sports and recreation were severely regulated. It reserved the right to freeze workers in their jobs or to move them to any part of Australia where they would better benefit the war effort.

ARRIVAL OF GENERAL MAC ARTHUR

Australia's late Prime Minister John Curtin, welcoming General Douglas MacArthur during World War II

Simultaneously, Prime Minister Curtin suggested to President Roosevelt that Gen. Douglas MacArthur, who had won fame throughout Australia for his defense of the Philippines, should be sent to take charge of the Allied war effort in the Southwest Pacific, with headquarters in Australia. This was done, and Gen. MacArthur named as his commander of ground forces the Australian Gen. Sir Thomas Blamey, who had been prominent in World War I as second in command of the Australian forces under Sir John Monash.

With the full agreement of the British and American governments, Curtin recalled Australian overseas forces from European and Middle-Eastern theaters and flung them against the Japanese in New Guinea. The threat of invasion of the Australian mainland was first checked when Allied naval forces smashed a powerful enemy amphibious force in May 1942 in the Coral Sea and scored another naval victory in June at the Battle of Midway. In August of 1942 the Australians opposed the Japanese landing at Milne Bay. After bitter fighting the Japanese forces were withdrawn by sea on Sept. 5, having suffered their first decisive land defeat in Southwest Pacific. Then began the offensive in the Owen-Stanley Ranges which culminated in Australian and American forces clearing the greater part of the northern New Guinea coast and opened the way to Hollandia and the north. By June 1944 Allied strategy had resulted in the reconquest or neutralization of the Solomons, the Bismarcks, the Admiralty Islands and New Guinea. This led

NATIVE DANCERS

Australian aborigines perform a dance known as the "Wild Duck Corroboree." In the unsettled areas of Australia, aborigines still lead their primitive lives, using the fire stick, stone knife, spear, and boomerang. These natives, however, helped to oust Japanese from territories they had captured early in World War II

to successful landings on the Halmeheras and eventually to the Philippines. While Australian forces invaded Borneo in May of 1945 other Australians took over the job of cleaning out the 90,000 Japanese troops by-passed in the New Guinea, New Britain and Solomons area. At the close of the war the Australian Army accepted the surrender of 261,000 troops in the islands south of the Philippines and to the north, northwest, and northeast of Australia.

Of all Australian men aged 18 to 40 years, two in every three served in the fighting services on a full-time basis at some time during the war. Australia entered World War II with only 12,900 full-time men in her navy, army and air force, and reached a peak strength of 633,400 in August 1943. At that time there were at least 860,000 people directly engaged on war work. Australia emerged from the six years' fighting with an armed strength of 554,700 men. Of the 244,100 men overseas, 224,000 men were engaged in operations against the Japanese. From a population of about 7,300,000 Australia enlisted almost 1,000,000 men for full-time service in the fighting services and, in addition, a total of 66,000 women in the Women's Auxiliary Services. Australia's casualties for the war totaled 95,561, 23,365 of whom were killed.

Prime Minister John Curtin died on July 4, 1945, and after a short interim period in which Deputy Prime Minister Francis Forde held office, Joseph Benedict Chifley was elected leader of the Federal Parliamentary Labor Party and automatically became the next Prime Minister.

The end of the war found Australia, in common with other nations, facing difficult tasks at home and abroad. The most significant post-war development from the Australian viewpoint has been its increasingly important role in international affairs. Her growing importance as a member of the British Commonwealth of Nations was indicated by the appointments of Australian Lt. Gen. John Northcott as Commander of the British Commonwealth Occupation Forces in Japan and of Mr. W. MacMahon Ball as British Commonwealth representative on the Allied Council in Tokyo and of Queensland Chief Justice Sir William Webb to the International Court to try major Japanese war criminals. Australia was elected a member of the United Nations Security Council where her delegates have played a vigorous and constructive role. Her major task at home has been regearing her wartime economy in preparation for the fulfillment of the government's immigration policy which aims at building Australia's population to 20,000,000 as swiftly as possible.

In foreign policy, Australia has tended to closer cooperation with the U.S., without, however, loosening the traditional ties of kinship and sentiment

MELBOURNE—AUSTRALIA'S SECOND LARGEST CITY

Buildings on Collins Street, Melbourne, are typical of modern architecture and city planning of Australian cities

with Britain. The Labour party, which came to power in Australia in 1941, found itself in a strong position following the parliamentary elections of 1946. Under its socialist administration, the transition from wartime to peacetime economy took place, and steps were taken to win long-term export markets. The welfare program was increased at the same time. In the 1949 elections, however, the Labour party suffered defeat and a coalition of the Liberal and Country parties returned to power for the first time in eight years.

PRIME MINISTER ROBERT G. MENZIES

During his term of office, Australia's importance in international affairs was greatly enhanced

Australian Ballot (*ạs-trā′lĭ-ạn*), a ballot first used in elections held in New South Wales, in 1858, and subsequently in all the subdivisions of Australia. With various modifications, it has been adopted in many countries, and is used in nearly all the states and countries where the elective franchise is recognized. The main features are that ballots used in voting are printed at public expense, the different party tickets are printed on the ballots, and each voter is supplied with one copy when he presents himself at the polls to vote. There is a legal provision against electioneering near the polls, and secrecy in voting is guaranteed by prohibiting an elector, under suitable penalty, from exhibiting the ballot to any one after it is marked. Separate voting booths are provided in which the voter must by himself mark and prepare his own ballot, if he is capable of doing so; otherwise it may be marked at his direction by two of the judges, who must belong to different parties, after which it is handed to the proper officer, by whom it is deposited in the ballot box. The system has tended to preserve both the secrecy and sanctity of the ballot.

Austria (*ôs′trĭ-ȧ*), a state of Europe, formerly a part of Imperial Austria-Hungary. The Republic of Austria was proclaimed in 1918, after the revolution following the First World War, and a federal constitution was adopted in 1920. As at present constituted, the area is 32,377 sq. m. It is divided into the nine provinces of Vienna, Lower Austria, Upper Austria, Carinthia, Salzburg, Styria, Tyrol, Vorarlberg, and Burgenland. The last mentioned was transferred to Austria in 1921. In 1948 the population was 7,062,942 (est.).

Description. The region embraced in Austria-Hungary included three great mountain systems, which, in the northwestern part, assume elevations very similar to the mountainous regions of Switzerland. The Austrian Alps extend from Switzerland to the Danube. Fine scenery and numerous caverns and mineral springs abound in the highlands, making some sections the most picturesque regions of Europe.

The drainage is almost exclusively to the southeast by the Danube and its tributaries. Other streams include the Inn, the Enns, the Salzach, the Mur, and the Drave. Numerous small lakes diversify and add beauty to the mountain scenery.

The uneven surface of the country causes it to have considerable diversity in climate. In the western part the rainfall is very abundant, about 100 in. annually, and in Vienna the rainfall is

Courtesy Brown Bros., N. Y.

LANDSCAPE OF THE AUSTRIAN TYROL

about 25 in., being limited on account of high altitudes causing precipitation before the moisture is carried to that section by the clouds. However, there is sufficient rainfall in all parts for the successful cultivation of plants adapted to the different temperatures. At Vienna the mean annual temperature is about 50°.

Animals. The native animals are like those found in most of central Europe, but the number and kind have been limited by the fact that the country has been populated for centuries. In the mountains, especially in the Alps, are a considerable number of game, especially deer and chamois. The fisheries of several small lakes and of the larger streams yield sturgeon and other commercial fish. Birds of song and plumage are abundant. The domesticated animals consist of those common to European countries. Horses and sheep are not reared as extensively as in former years, but cattle are grown in large numbers for beef and dairy products. Goats are reared for their flesh and skins, and sheep are grown in all parts of the country, but receive special attention in Tyrol. Bee-keeping and silk culture are important enterprises and yield large returns.

Agriculture. Agriculture is the chief occupation, over one-half of the people engaging in that enterprise. Austria is noted for its production of cereals but imports large quantities of foodstuffs annually. Oats, potatoes, rye, barley, and wheat are grown on a large acreage, and interest in the culture of corn, buckwheat, and millet is extensive. Sugar beets, tobacco, and orchard products such as grapes, apricots, chestnuts, and apples are raised. Sugar is produced, though not enough for domestic consumption.

Minerals. Mining has been an important enterprise in some parts of the country for centuries, and there are traces of mines worked by the Celts and Romans. Almost every known mineral is found, and considerable deposits of clays, building stones, and useful earths exist in paying quantities. Austria was deprived of its rich salt mines in Galicia after World War I, but still has salt deposits. Salt is also derived from evaporating the waters of salt springs. Gold is produced in small quantities. Coal, silver, iron ore, copper, lead, zinc, gypsum, antimony, and manganese are mined in small quantities.

Manufacturing. Industry has been greatly advanced under the Republic in an effort to regain pre-World War I exports. The clothing industry is developed to a high extent in the western part, which is true also of the manufacture of textiles, articles of food, building materials, steel, and iron. Austria holds high rank in the manufacture of glass. Austrian art ware is seen in large quantities at international expositions and sold extensively in all civilized countries. Vienna has the largest milling enterprises of Austria, taking rank in the output of flour with other European cities. Pottery, machinery, earthenware, firearms, and wooden and dairy products are among the important industrial items.

Commerce. The country has limited commercial interests, the imports exceeding the exports. The loss of the coast line on the Adriatic prevents the country from taking rank with the nations more fortunately situated; however, the River Danube furnishes an excellent route of commerce with neighboring countries. Wheat, fruit, flour, sugar, ceramics, leather, clothing, optical and electrical equipment, and minerals are the chief articles of export. In normal times, tourists contribute heavily to the Austrian economy.

Transportation. The first railroad in Austria was built in 1837. Since 1846, most of the railroad lines have been owned and operated by the state. Total railroad mileage is *ca.* 3,600, exclusive of urban and interurban electric lines. Electrified lines are common because of widespread exploitation of hydroelectric power. There are some 18,500 m. of federal and provincial roads and highways. Water transport is provided by several canals and by the Danube River, which is navigable for river craft throughout its course and provides a direct outlet to the Black Sea.

Education. Public education, governed by fairly high standards, has long been common. Illiteracy is virtually unknown, being estimated at as little as 1.5 per cent. School attendance is compulsory from age 6 to age 14. Elementary schools, which combine some vocational training with the standard studies, number some 5,300, and there are *ca.* 170 secondary schools; total enrollment in both types is over 900,000. Some 550 commercial, technical, vocational, fine arts, and teacher training schools and colleges enroll *ca.* 125,000 students. Three universities, at Vienna, Graz, and Innsbruck, have a combined enrollment of *ca.* 8,000; and two technical schools, at Vienna and Graz, have some 3,000 students. The universities offer courses in theology, law, political economy, medicine, philosophy, engineering, and other branches of higher learning. There are 12 theological colleges, of which 10 are Roman Catholic.

Religion. The prevailing religion is Roman Catholic, although all forms of worship are permitted. The groups ranking next numerically to the Catholics are Protestants and Jews, although the numbers of the latter were drastically reduced by persecutions during the Hitler regime.

Population. The population of Austria is almost entirely Germanic, and the language is German. Vienna, the capital of Austria and formerly of the Dual Monarchy, is one of the largest cities of Europe. Other major cities are Salzburg, Graz, Linz, Villach, Baden, Innsbruck, Klagenfurt, Steyr, St. Pölten, and Wiener-Neustadt.

Defense. The Austro-Hungarian army in November 1918 comprised *ca.* 2,229,500 officers and men (the purely Austrian figures are not separable). The Treaty of St. Germain (Sept. 10, 1919) reduced the Austrian army to 30,000 men and outlawed compulsory military service and the importation of armaments. Post-1918 readjustment of boundaries cost Austria her Adriatic coastline and her fleet. Following the example of Germany, Austria announced in May 1936 a policy of rearmament, raising her army to 150,000 men and adopting conscription. Upon the German absorption of Austria (March 1938), Austrian troops were merged with those of Germany. By the Austrian State Treaty of 1955, Austria, although pledged to neutrality, was permitted to set up an army of 53,000 men, but internal political problems indicated that it might be some time before that figure was reached.

Government. Austria-Hungary, which existed until 1918, was a hereditary monarchy composed of the Empire of Austria and the Kingdom of Hungary, united in the person of a ruler from the House of Hapsburg-Lorraine. The *Ausgleich,* or agreement, of 1867 created this dual monarchy with a common administration of state affairs, a customs union, a common coinage, system of weights and measures, and joint issuing bank, and a uniform control of monopolies and railways. The ministries of each country were controlled by delegations from the separate parliaments maintained at Vienna and Budapest, respectively. The Reichsrat (parliament) of the Austrian Empire represented 17 crownlands which bore different relationships to the person of the Emperor or to the organization of the central government, and caused the Empire to partake at the same time of the character of a federal state and of a centralized monarchy. The Reichsrat, which assembled annually, consisted of a Herrenhaus (House of Lords) and an Abgeordnetenhaus (House of Representatives). But the Emperor, as the source of law and justice, had the power to make treaties, issue ordinances, grant pardons, appoint officials, and to summon and dissolve the legislatures. He could initiate legislation through his ministers and, in case of necessity, suspend the constitution and legislate provisionally by ordinance. The provincial diets. which were unicameral, controlled local government and taxation, agriculture, public works. territorial domains, schools, and charitable institutions.

The Kingdom of Hungary, comprising Hungary proper with Croatia and Slavonia, had a constitution originating in the Golden Bull of 1222 and culminating in the law of June 8, 1867. The Hungarian Parliament was composed of an Upper House and a Lower House, the latter chosen by the entire male population over 20 years of age. The members of the Upper House, or Table of Magnates, were largely great landowners who often opposed the popular chamber. A cabinet of nine ministers and a president controlled the executive power in Hungary. The cost of the common affairs of the Austro-Hungarian monarchy was borne by both states in a proportion agreed upon every 10 years.

The monarchy fell in 1918, and Hungary was separated from Austria. The Austrian republican constitution of November 1920, amended in December 1929, extended the power of the president, increased his term to six years, and gave him the right to issue decrees at a time of national emergency, with the consent of the cabinet. The Nationalrat, or assembly, was elected by popular vote for four years, and the Bundesrat, or federal council, was chosen by the provincial diets in proportion to their population. The powers of this latter chamber were principally advisory.

In March 1938, German troops seized Austria. It was absorbed into the German Reich as a *Land,* or federal division of Germany, to be known as the Ostmark; in 1940 it was divided into eight *Gaue,* or districts. The Austrian army, national bank, and railway system were merged with those of Germany. Austrian diplomatic representation abroad ended, and the German mark replaced the Austrian currency. Although there was no officially recognized Austrian government-in-exile, the Allied nations in World War II promised the eventual liberation of Austria.

Shortly after the Allied capture of Vienna (April 13, 1945), a provisional government was set up, after which free elections, supervised by the four occupying powers, re-established the Austrian republic, under the 1929 constitution. Under the terms of the Austrian State Treaty, the Allied Council, which had supervised the activities of the Austrian government since 1945, discontinued its work on July 27, 1955, leaving Austria once again a sovereign state.

History. The history of the region formerly included in Austria-Hungary is associated in its early phases with that of Rome and the empire of the West and subsequently with the Germanic tribes which arrived in waves from northern regions. Austria as a political power may be said to have taken its rise in 791, when Charlemagne took possession of the region between the Enns and Raab, driving the Avars from that territory. The Magyars invaded Germany in 907, when part of the region now included in the country became subject to that people, under whose control it remained 48 years, when it was again united with the German Empire under Otho I. From 976 till 1246 it was under control of the counts of Babenberg, became a duchy in the latter year, and received additional territory in 1192, when Vienna became its capital. In 1246 the male line of the house of Babenberg became extinct, and the German emperor, Frederick II, proclaimed the region hereditary property of the German sovereigns. It passed in 1282 to the House of Hapsburg. whose original possessions were in Switzerland Rudolph of Hapsburg, one of the early sovereigns, was succeeded by his son Albert, who in 1301 obtained the Swabian Margraviate. At his death in 1308 Austria had an area of 26,000 sq. m. Albert V, son-in-law of Emperor Sigismund, was the next monarch of marked influence. He assisted Sigismund in the Hussite War, became Emperor of Germany in 1437, and was succeeded by Ladislaus, his posthumous son, in 1438; until 1918 the Austrian Hapsburg line was unbroken.

Austria rose to first rank as a European monarchy by acquiring The Netherlands through marriage in 1477, Bohemia in 1526, and Hungary in 1527. When Ferdinand I was crowned Emperor of Germany (1556), he inherited all the German lands of his elder brother, Charles V of Spain. Religious wars and rebellion in Hungary and Bohemia threatened Hapsburg unity, and as a result of the Peace of Westphalia in 1648, which ended the Thirty Years' War, Austria was forced to cede Alsace to France. The Hungarians intrigued with the Turks against Austria; in 1683, the Turks besieged Vienna but were driven off by the Polish king and a German army. The death of the last Spanish Hapsburg, Charles II, precipitated the War of the Spanish Succession. By the Peace of Utrecht in 1713, after brilliant victories led by Prince Eugene of Savoy, Austria annexed the Spanish Netherlands and Spain's holdings in Northern Italy. Charles VI, the last male Hapsburg, was succeeded by his daughter,

THE REVOLUTION OF 1848
A contemporary sketch

Maria Theresa, under the Pragmatic Sanction. In the Seven Years' War (1756-63), Austria lost Silesia, but was compensated by the acquisition of Cracow in the partition of Poland in 1795.

Francis II of Austria was the first sovereign to take the title of Emperor of Austria, as Francis I (1804). It was within the period of his reign that the German princes united in the defense of their countries and sent a powerful army to join the Russian and British allies against Napoleon, thus causing the overthrow of the latter. He was succeeded at his death (1835) by his son, who ascended the throne as Ferdinand I, and succeeded in overthrowing the revolutionary movement led by the Hungarians under Kossuth in 1848. Ferdinand abdicated in favor of his nephew, Francis Joseph I, who joined the German states (1864) in their war taking territory from Denmark. Two years later Austria and Prussia entered into a struggle for the domination of German lands which was won by Prussia.

Since the *Ausgleich* (compromise) of 1867, the government gave marked attention to the internal affairs of the empire, encouraging railroad building, the extension of educational arts, and the furthering of industrial and commercial enterprises. In 1878, the domain of Austria was enlarged by the annexation of the provinces of Bosnia and Herzegovina. These provinces were placed under the crown by the Treaty of Berlin for administration and military occupation only, which remained their condition until 1908, when they were annexed as imperial territory by a proclamation of Francis Joseph I. The *Dreibund* (Triple Alliance) was formed in 1882, which pedged friendship among Austria-Hungary, Germany and Italy. In 1914 Archduke Francis Ferdinand was assassinated and the country became involved in the Great European War, in which she was supported by Germany, Turkey, and Bulgaria, while Italy withdrew from the *Dreibund* and in 1915 joined the Triple Entente. Francis Joseph died in 1916, and was succeeded by Charles I as emperor. He abdicated in 1918, following the defeat of his armies in Italy, and Austria-Hungary formed two separate nations, while many minorities such as the Czechs, joined in the federation of new states. The country was dismembered by the Paris Peace Congress. The Treaty of St. Germain in 1919 defined Austria's frontiers, which were finally settled in 1921. An American relief mission distributed $72,000,000 in Austria during 1919-20, but Austria, stripped of her empire and her Adriatic ports, became an economic liability. International loans amounting to about $200,000,000 were finally secured but did not change the economic situation. During this period, the Conservatives and the Social Democrats struggled for power. Private Fascist armies made their appearance. Economic chaos and unstable government were aggravated by the withdrawal of foreign loans. These conditions became spectacularly apparent by the failure of the Credit Bank, an organization which dominated not only Austrian

CAPTURE OF GAVRILO PRINCIP, THE ASSASSIN OF THE ARCHDUKE FERDINAND

commerce but that of southeastern Europe as well. A customs union with Germany was prevented by the World Court. Hitler's rise to power in Germany (1933) increased internal unrest in Austria. The Socialists were crushed after bloody strife by Fascist (*Heimwehr*) armies abetted by the government, and (July 1934) Chancellor Dollfuss was murdered by a pro-Nazi group. Chancellor Schuschnigg vainly attempted to preserve Austrian independence against the pressure of the Rome-Berlin Axis (1936). Despite an agreement between Hitler and Schuschnigg (February 1938), the Germans marched into Austria on March 12, and on April 10 the annexation was sanctioned by a German-instituted plebiscite. For the next seven years, Austria was a vassal province of Germany.

When the victorious Allies entered Vienna in April 1945, a provisional government of national liberation was established under the supervision of the Allies, who divided Austria into four occupation zones (U.S.S.R.—Lower Austria; U.S.—Upper Austria; France—Tyrol; Great Britain—Carinthia). Vienna, in the Russian zone, was jointly occupied by all four powers.

The first government of the reconstituted republic was formed by Karl Renner, a Socialist chancellor of the former republic. Free elections were held, and the republic was recognized internationally in 1946. The Renner government and subsequent coalitions headed by Leopold Figl and Julius Raab tried to raise the nation's war-ravaged economic level and to maintain friendly relations with each of the occupying powers. Russia, however, considering Austria part of Eastern Europe, sought to dominate the country, while the U.S., anxious to maintain Western influence, granted credit and other aid to Austria. These tensions held up agreement on an Austrian peace treaty for ten years, though meanwhile France, Great Britain, and the U.S. relaxed the stringency of their occupation.

At last (May 15, 1955) a State Treaty ended the occupation and restored Austrian sovereignty in exchange for a pledge of permanent neutrality and some trade concessions to Russia; later in 1955 Austria was admitted to the U.N., and, in 1956, the parliament approved Austrian membership in the Council of Europe, an organization of Western European nations, established in 1949.

Austrian Succession, WAR OF THE, 1740-1748, a European war in which the nations involved were aligned as follows: Austria joined by Holland and Great Britain against France, Spain, Bavaria, Prussia, and Sardinia. It concerned the succession of Maria Theresa (1717-80), Queen of Hungary and Bohemia, to the Austrian throne. The Empress of Russia, Elizabeth Petrovna (*q.v.*), joined Maria Theresa in the controversy, which commenced when Frederick II the Great of Prussia and his troops entered and claimed the duchy of Silesia. The war ended with the Treaty of Aix-la-Chapelle (1748), giving Silesia to Frederick II, and establishing Maria Theresa and her husband as rulers of the Austro-Hungarian Empire, as well as restoring to Austria all lost territory except Silesia, Parma, and Piacenza.

Autarchy (*ô'tär-ḳў̆*), from the Greek word *autarchia,* meaning autocracy; it signifies an absolute rule, for instance, that in Czarist Russia.

Autarky (*ô'tär-ḳў̆*), national self-sufficiency in all phases of economy, industry, and agriculture. Such a state is sought by a country at war in order to sustain and improve its war effort, and in the two World Wars it was even forced upon neutrals by the attempts at autarky of the warring nations.

Autochrome Process (*ạ'tō-ḳrōm*), an early process of color photography developed by A. and L. Lumière (1904). The photographic emulsion contains a layer of minute, evenly distributed starch grains, dyed red, green, and blue. Through exposure and developing, each grain transmits only its own color of light, thus producing a positive picture in naturạl color.

Autocrat of the Breakfast Table (*ạ'tô-ḳrăt*), the title of a popular book (1858) by Oliver Wendell Holmes (*q.v.*). Speaking as the Autocrat, in extended monologues, Holmes combines conversational humor with philosophical discourses.

Auto-da-fé (*ạ'tô-dȧ-fā'*), a public ceremony instituted at Seville in 1481, and used in connection with the Inquisition (*q.v.*) in Portugal and Spain. In it, the Holy Office announced its judgment of those charged with crime (primarily that of heresy). Those found not guilty were discharged; and soon afterward the secular authorities burned the guilty at the stake or imprisoned them for life. The term auto-da-fé has also been applied to the execution itself.

Autogiro (*ạ-tō-jī'rô*). See *Aviation.* See also color plate, *Man Masters the Air,* Volume II.

Autograph (*ạ'tō-grȧf*), a term applied either to the signature to a document which concerns the signee, or to a document entirely written by a famous person. The term is also applied to a person's signature, particularly that of a celebrity.

Automation (*ạ-tô-mā'shŭn*), a term coined to describe the performance by mechanical or electronic devices of tasks otherwise handled by men or by man-tended machines. A familiar instance of elementary automation is the player piano, in which keys are moved by compressed air passing through holes in a perforated roll of paper; the principle of the giant computers or "magic brains" is similar, except that the operating agents are multitudes of electronic tubes or transistors actuated by pre-set tapes.

Automation in its present phase may be said to have begun with World War II, when electronic computers could spot an approaching airplane, calculate its speed and range, track it with a gun, and fire a shell, faster than human hands and brains. An expanding postwar economy plus a manpower shortage (particularly in the U.S.) hastened its application to industry. The term was first used to describe the automatic shift of auto parts from one metalworking machine to another; now one or two men, pushing buttons and watching control dials, can machine hundreds of motor blocks passing in one continuous operation, or three men at control panels can run an entire oil refinery.

Automation not merely saves human labor but improves upon it: the electronic brain does more in a few minutes, and more accurately, than a battery of mathematicians could do in days, and the electronic tool can machine parts to tolerances nearly impossible to the most skilled worker. The more complex devices can catch their own errors, warn of possible malfunctions, and stop themselves automatically if anything actually goes wrong. With its joint prospects of increased profits for manufacturers and increased leisure and income for workers, the development of automation has been called the "second Industrial Revolution."

Automatism (*ạ-tŏm'ȧ-tĭz'm*), the performance of acts apparently without volition, such as is occasionally seen in those afflicted with somnambulism, hysteria, or epilepsy.

Automaton (*ạ-tŏm'ȧ-tŏn*), a self-acting machine, such as a clock or watch. The name is likewise applied to a figure made in imitation of an organic being, as a toy turtle with means to propel itself, or a machine performing actions like a human being. The construction of automata dates from long before the Christian era. The vocal brazen head of Roger Bacon (*q.v.*) was perhaps such a device; others have included birds which fly and sing, trumpeters which play marches, human figures which can write, draw, and play cards. The famous clock at Strasbourg (*q.v.*) is one of the best-known automata. Familiar nowadays are the lifelike Santa Clauses and other figures of mobile display advertising. See also *Robot*.

Automobile (*ä-tō-mō-bēl'*), a self-propelled vehicle that has probably changed life in America more than any other single invention in the last half-century. In its early years both expensive and unreliable, it is today the backbone of the American transportation system. The city worker is no longer compelled to live in crowded towns; the farmer is no longer isolated in the country. Automobiles and trucks are the means by which thousands of communities get workers to their jobs and children to school and move most of their merchandise. The manufacturing and servicing of automobiles is a vital part of the national economy and affects many industries. One out of every seven workers in the U.S. is employed in automotive production, servicing, or transportation. Steel, rubber, glass, textiles, leather, and many other lines owe much of their activity to the automobile manufacturers. The petroleum and road-construction industries owe their growth directly to the rise of the automobile.

Since 1900, when only 4,192 "horseless carriages" were produced, automobile output has expanded almost continuously, until in 1955 the record total of 7,900,000 units was produced. (Production declined somewhat from this high point, however, in 1956, 1957, and 1958.) In production and use the U.S. leads the world, with 51,432,000 cars on the roads in 1957, or nearly 70 per cent of the world's total. The number of cars in use in the U.S. has doubled since 1940. The resulting traffic congestion has given rise to a new multi-billion-dollar, 13-year Federal highway program, as well as a host of state and local programs. Huge suburban shopping centers and a rapid growth of city parking garages and lots also reflect the increased use of automobiles. Fully three-fourths of all American homes have at least one automobile, and the number of two-car families has steadily grown; by 1957, 13 per cent of all U.S. families had two or more cars.

The automobile won its position of essentiality by steady improvements in design and reliability. Manufacturers annually added, and still add, new features contributing to safety, comfort, ease of control, and durability. Interior and exterior designs, in the U.S., are changed annually. Many styling changes are truly functional, introducing streamlined contours, more glass for visibility, easier mechanical operations; other innovations are sometimes aimed merely at speeding obsolescence. European car makers, on the other hand, tend to avoid substantial annual styling or engineering changes.

HISTORY: For more than two centuries, European inventors attempted to develop a self-propelled road vehicle. The only obvious power source was steam. Around 1678, Ferdinand Verbiest, a Jesuit missionary in China, built a steam-powered car. In 1769 Capt. Nicholas-Joseph Cugnot, in France, built a steam tractor to haul artillery, but this developed a top speed of only two miles per hour.

In 1801 Richard Trevithick (*q.v.*), an Englishman, built a steam-powered vehicle designed to carry passengers. Later vehicles developed by Trevithick achieved some success and operated in England on regular schedules for a short time, beginning *ca.* 1820. Several other steam carriages were built in this period. In one of these, Sir Goldsworthy Gurney drove 200 m. from London to Bath and back, on the highways, breaking all distance records of the time. Some machines carried as many as 14 passengers. But the noisy and ungainly vehicles roused opposition because they frightened horses and destroyed road surfaces. Opponents, led by stagecoach and railroad proprietors, obtained a law requiring that a man carrying a warning red flag must walk ahead of any steam carriage on the highways. This law effectively ended the use of steam carriages in England until its repeal in 1896.

The first motor vehicle in the U.S. was a steam wagon built in 1805, called the Amphibious Digger and designed to operate on both land and water. Beginning just before 1900, the White and Stanley companies built numerous steam cars, some of which remained in production until *ca.* 1925. One major disadvantage of the steam car was the time required to build up boiler pressure.

A new source of power, the internal-combustion engine, was developed in Europe by several inventors (*ca.* 1860-85). In 1863, Jean-Joseph-Étienne Lenoir, a resident of France, designed a one-cylinder internal-combustion engine using illuminating gas as fuel. The gas was drawn into the cylinder during part of the power stroke and was then ignited to provide power to complete the stroke. In 1876 a four-cycle engine (see under Construction, later in this account), operating on the same principle as the modern engine, was developed by Nicholas A. Otto, of the German firm of Otto and Langen. By 1885 Gottlieb Daimler, of the same firm, had built a two-wheeled motorcycle powered by a light four-cycle engine operating at 900 revolutions per minute, or nearly eight times the rate of previous engines. Daimler's engine was also a major contribution to the problem of weight-power ratio: the slower Otto engine weighed some 725 lbs., Daimler's only 88 lbs. At about the same time, Karl Benz, another German, designed a three-wheeled gasoline-powered vehicle. Cars made by Daimler and Benz later became famous throughout the world.

Using Daimler engines, Émile Levassor, a Frenchman, began (1890) to manufacture automobiles. His contribution to improved design was to put the engine in front; until then, automobiles had been literally horseless carriages, with the engine mounted in the rear. Chain drives, used until *ca.* 1898 to carry power to the rear wheels, were succeeded by a revolving shaft, first used by Louis Renault, a Frenchman.

In 1893 Charles E. Duryea (*q.v.*) and his brother J. Franklin (or Frank) built the first successful gasoline-powered car in the U.S., at Springfield, Mass. In the next year, Elwood G. Haynes asked two machine-shop operators in Kokomo, Ind., Elmer and Edgar Apperson, to build a full-scale model of a gasoline-powered automobile which he had designed.

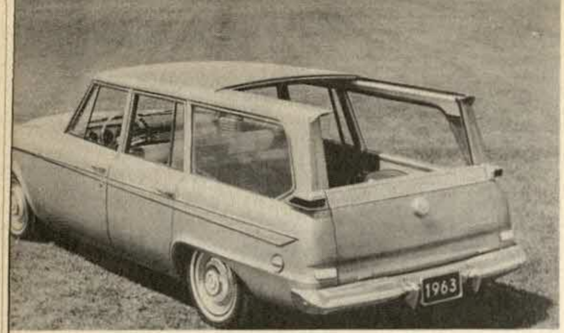
American car makers, later to lead in volume of output, thus began making gasoline-powered automobiles some years after the German and French producers. For years in the U.S. until 1900, more electric-powered cars were made than gasoline-powered cars. Electric cars, driven by storage batteries, were less noisy and more easily controlled; but their short range and lower speed have limited them to a few specialized functions.

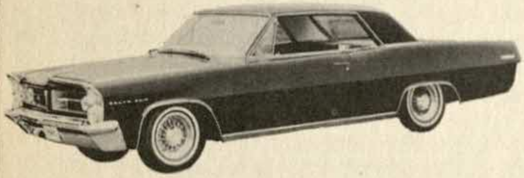
The first gasoline-powered automobile built and driven in Detroit was developed by Charles Brady King in 1896. At about the same time, Henry Ford (*q.v.*) had built a two-cylinder four-horsepower car in Detroit and Ransom E. Olds had designed a one-cylinder car in Lansing, Mich. Ford and Olds later became the first important mass producers of automobiles. The Ford Motor Co., formally organized in 1903, was highly successful from the start. In 1908 the first low-priced Model T Ford appeared. Aided by a vast sales and service organization, the Ford company was to dominate the entire field until 1927.

From 1901 on, Detroit (*q.v.*) was the center of U.S. automobile manufacturing. Michigan had much hardwood (used in early cars), and the Great Lakes provided economical shipping for coal, iron ore, and steel. To reduce shipping costs, the major producers later set up parts and assembly plants in various parts of the country. Ford and the General Motors Corp.—formed by a merger of several smaller firms in 1908, and nowadays the nation's largest producer—pioneered in this movement, and were later followed by the Chrysler Corp. Decentralization has been even more conspicuous since World War II, spurred by both economic and defense-production considerations.

The early Detroit car makers quickly adopted and perfected mass-production (*q.v.*) methods. To the idea of interchangeable parts, begun by Eli Whitney (*q.v.*), R. E. Olds added the idea of moving the chassis past a line of workmen, each responsible for fastening a different part to the frame; and Henry Ford further speeded up the process by installing mechanical conveyers to carry the frames past the workmen. Production time was thus sharply and economically reduced.

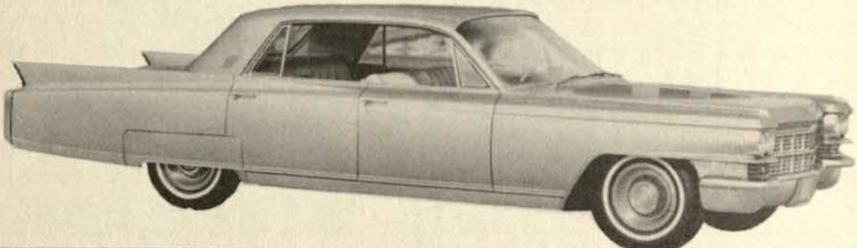
Further economies were effected by the use of high-speed machine tools to make parts. Massive stamping machines reduced man-hours by forming large body components out of sheet metal. Automatic machines were developed for specific jobs. This trend has reached a peak in the modern automobile-engine plant, where full use is made of automation (*q.v.*). Here electronically controlled machine tools perform a series of milling and boring operations on the engine block, which is moved automatically from one work

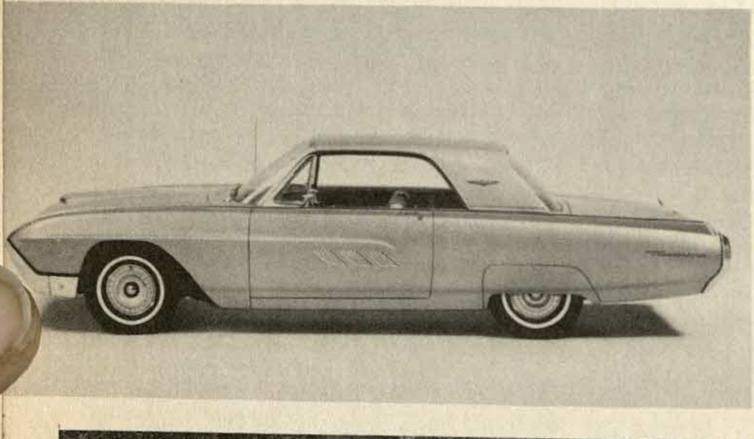


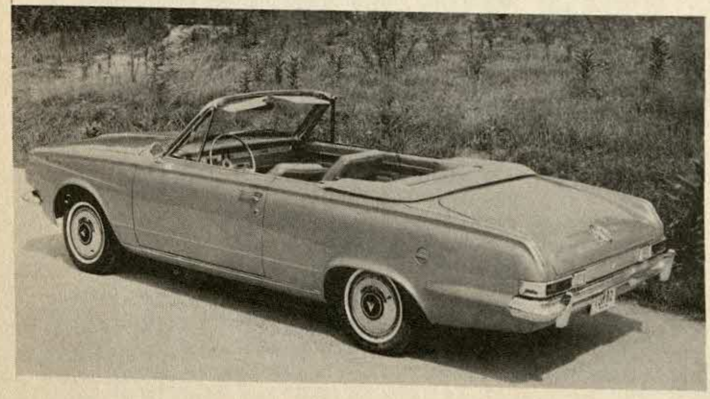


station to the next. Closely coordinated with the automobile plants are the suppliers of parts and materials, whose shipments are so accurately timed that their plants are, in effect, extensions of the main assembly line.

The modern automobile contains more than 13,500 individual pieces of material. The economic importance of the industry to the nation may be indicated by the materials consumed in an average year, 1956. Automobile production accounted for 18% of all the steel used in the U.S. in that year, including 42% of all sheet metal; 7% of all copper; 42% of all lead; 28% of all zinc; 64% of all synthetic rubber, mostly used in tires; and 71.5% of all upholstery leather. In addition, the industry used 187,000,000 sq. ft. of glass. In some years it has used as much as 210,000,000 lbs. of cotton.







MODERN AUTOMOBILES
(from top to bottom)
The Studebaker station wagons for 1963, exemplified here in the four-door Wagonaire, featured a metal sliding roof panel telescoping forward almost to the centerline, providing greater visibility for the driver and greater versatility in use for the wagon. Pontiac's Grand Prix series aimed at a combination of sports car appeal and superior performance, featuring simplicity of styling. The luxury model of the Cadillac line is the Fleetwood Sixty, distinguished by its individual roof treatment and heavy chrome molding along the lower edge of the body. The Ford Thunderbird held its place as one of America's "luxury" cars. It introduced, among other 1963 models, the hardtop shown here; the entire line featured a sharp reduction in maintenance requirements. Chrysler added to its Valiant line of compact cars the Signet 200 convertible, featuring bucket seats and a manual or automatic top operation

Improvements in design and performance of the modern car have been made possible by extensive research and development programs carried on by the manufacturers and their suppliers (*e.g.*, makers of steel, glass, paint, rubber). Each great step forward in engineering and design has broadened the market for automobiles. Early developments included such innovations as the speedometer (1901), the windshield (1903), the front bumper (1906), the electric horn (1908), and electric headlights (1909). A major step was the introduction of the electric or "self" starter (1911), which placed car driving within the strength of the average woman. Before this device, the engine had to be cranked by hand, a hard and sometimes dangerous task. The steel body came in 1912 and the steel top in 1933—both substantial additions to safety. Closed car bodies, which made all-weather driving practical, were first offered in 1904 but did not become widely popular until 1927-29, when they became standard, at relatively low cost, on virtually all makes of cars.

Other developments which added to comfort and safety were the rear-view mirror (1911), four-wheel hydraulic brakes (1915), the rear stop-light (1916), the automatic windshield wiper and safety (nonshatterable) glass (1923), the hot-water car heater (1926), the built-in radio and the foot-controlled headlight dimmer (1929), and the built-in defroster (1936). Low-pressure ("balloon") tires came in 1922 and tubeless (nearly "flat"proof) tires in 1948. Other comparatively recent improvements are automatic transmissions, dual headlights, power steering, power brakes, weatherproof enamels, and new types of suspension—ball-joint, torsion-bar, and air-bellows—to contribute to softer riding. Improvements have been spurred largely by the highly competitive nature of the industry. Generally speaking, increased horsepower has tended toward larger sales, whereas safety features such as seat belts and dashboard padding have shown less sales appeal. Increases in horsepower were stressed in the years after World War II, especialy in 1950-56. In the latter year, however, the major makers agreed, in the interest of safety, not to advertise horsepower ratings or stress potential speed.

CONSTRUCTION: Basically, all automobiles are alike in consisting of a frame or chassis, an engine or power source, a gearing system to permit variations in speed, a clutch or device to permit disengagement of the engine from the drive shaft, so that the motor may run while the car is stationary, and an electrical system to power the ignition and auxiliary equipment.

Chassis. Originally built almost entirely of wood, the body and frame are today made of durable sheet steel. In most plants, frame and body are assembled on separate lines until the point is reached where the body is "dropped" by an overhead conveyer onto the chassis and is riveted to it. Recently, some manufacturers have developed a "unitized" body, *i.e.*, the body and chassis are completely integrated in the manufacturing process.

Engine. The standard modern engine is the four-cycle engine, in which the piston makes four strokes. (*1*) The intake stroke draws a gasoline-air mixture down into the cylinder; (*2*) the compression stroke (upward) squeezes this mixture to the top of the cylinder, where it is ignited by an electric spark; (*3*) the power stroke results from the explosion of the burned gases; and (*4*) the exhaust stroke pushes the burned gases upward and out at a relief valve. The pistons are linked to connecting rods which turn the crankshaft.

The burning of fuel and the friction resulting from metal parts rubbing together cause heat, which must be controlled through cooling and lubricating systems. Water jackets built around the cylinders keep them from getting so hot that the metal might melt or crack. Water, forced through these jackets by a pump, absorbs heat from the cylinders and is then carried back to the radiator, where an engine-driven fan speeds the flow of air through the radiator for rapid cooling of the water. In winter, the water must be kept from freezing by the addition of alcohol or other anti-freeze chemicals.

Destructive friction in the engine, which would cause it to wear out rapidly, is counteracted by keeping several quarts of oil in a pan called a crankcase, below the engine. Some moving parts splash in this reservoir of oil. The main bearings are lubricated by a flow of oil carried to them by means of an engine-operated pump-and-pipe system. Other moving parts must be individually lubricated at regular intervals.

Fuel. The vast majority of cars today use gasoline as fuel. The gasoline is mixed with air in the carburetor (*q.v.*), approximately 15 parts of air to each part (by weight) of gasoline. In the carburetor, gasoline coming from a float chamber is vaporized by air which rushes through a tube, or venturi, at high speed. Suction from the engine pulls the air through the venturi, and the speed of the air flow is accelerated by the shape of the venturi, which narrows at one point and then widens. Purity of the air is assured by a cylindrical air cleaner, or filter, mounted on top of the engine, above the carburetor. To step up the fuel-burning capacity of the engine and thus increase its power and flexibility, some manufacturers have provided four-barrel and six-barrel carburetors. Speed of the car is controlled by the driver through the accelerator pedal, or throttle, located on the floor. This regulates the flow of the fuel mixture from the carburetor to the cylinders of the engine.

Ignition. The ignition system of the car sets fire to the gasoline-air mixture in the cylinders with an electric spark, provided by the spark plugs. The ignition system consists of the starter, which cranks the engine and so provides the compression of gas needed for the initial explosions; the battery, which provides power for the starter; the switch, operated by a key or button, which turns on the electricity; the coil, which increases the voltage of the electric current to enable it to leap the tiny gap between the electrodes of the spark plug; the distributor, which accurately regulates the flow of electricity to each spark plug, in proper firing sequence; and the spark plugs, which ignite the fuel inside the cylinders. Two spark plugs are sometimes used, to assure even and complete burning of the fuel. When the engine is running, electricity is supplied for various needs by a small dynamo or generator, driven by the engine.

Power Train. The power train of the car consists of the engine, the clutch, the transmission, the drive shaft, the differential gears, and the rear axles, which drive the rear wheels. In the engine, the motion of the pistons is essentially vertical. This motion is transmitted by connecting rods to a crankshaft, to become the motion of the drive shaft, rotating parallel to the axis of the car; this motion, at the "differential" gears, each connected to a separate axle, is translated into forward motion by the rear, or driving, wheels. These gears permit the rear wheels to move at different speeds in rounding curves, thus providing stability and balance.

Clutch. The clutch is a device used to cut off power flow from the engine to the driving wheels. There are two types. The *friction clutch* consists of two facing metal plates which, when together, carry the torque of the engine to the drive shaft and the rear axles. With the friction clutch, the driver must coordinate hand and foot action. He must step on the clutch pedal, depressing it and thus pushing apart the clutch plates, in order to move by hand the gear-shift lever from low gear, to second gear, to high gear, or to reverse.

In *hydraulic coupling,* installed in the majority of new American cars, a spherical container holds oil which is given a whirling motion by a circular set of blades, called the "driving member," operated by the engine. This whirling motion of the oil is communicated to another set of blades, called the "driven member," which turns the drive shaft.

Transmission. The transmission system consists, in most passenger cars, of a set of gears providing three forward speeds and a reverse. Some cars have a fourth forward speed, and all heavy trucks have several. Many standard-transmission cars have an optional device called an "overdrive," a separate set of gears which take over and provide a fourth forward gear at cruising speeds. For many years, and on many cars today, gears were changed or "shifted" by a hand-operated lever. Most modern American cars now have hydraulically operated automatic transmissions. With these, the driver merely moves a lever to a "drive" position; then, as the throttle feeds more fuel, the automatic transmission shifts from low to second and then to high gear, and "down" and "up" again as driving conditions require. Automatic transmissions were installed in 4,900,000 American-made cars in 1957, or 79 per cent of the total production.

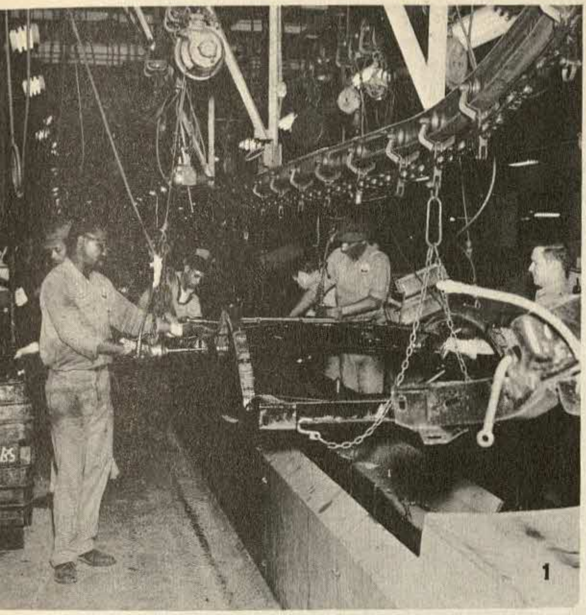
Steering. The steering wheel operates, through gears, a steering shaft which, by a system of linkages, directs the front wheels to guide the car. In recent years, power steering has been installed in many new cars; it is particularly helpful in the complicated maneuvers required to park a car in a small space.

Brakes. Propulsion implies the need for means of slowing or stopping. Modern brakes, operated by foot pedals, are designed to apply equal hydraulic pressure to all four wheels simultaneously. To cope with higher speeds and heavier car weights, power brakes have recently been developed.

Power Devices. Besides power steering and power brakes, many modern cars have power-operated seats, for adjusting the height and leg-room of the driver's seat; power-operated push-button windows; and power-operated antennas for automobile radios. Most of these devices draw their power from the engine. To some extent, the great increase in American car horsepower has been called for by the large number of such power devices.

Other Engines. Although the gasoline engine is used in virtually all passenger cars, the diesel engine, which burns low-cost oil, has become increasingly important in trucks. Despite its fuel economy, the high initial cost of the diesel engine has so far barred its use in mass-production automobiles in the U.S. The diesel, like the gasoline engine, is an internal-combustion engine which uses expanding gases to move a piston. In the diesel, however, the fuel-air mixture is detonated by compressing the air and raising the temperature to *ca.* 800° to 1,000° F., rather than by a spark. Oil is sprayed into the cylinder and ignites after the temperature of the air has been raised by compression.

Experimental models of gas turbines have also been shown by automobile makers. These engines resemble the turbines used in jet and turbine-propeller ("turboprop") aircraft. The exhaust from the turbine is used as a power source to drive the rear axles, just as the turboprop engine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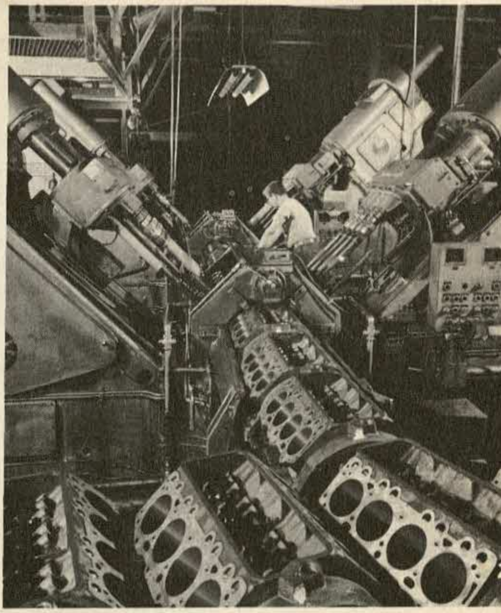

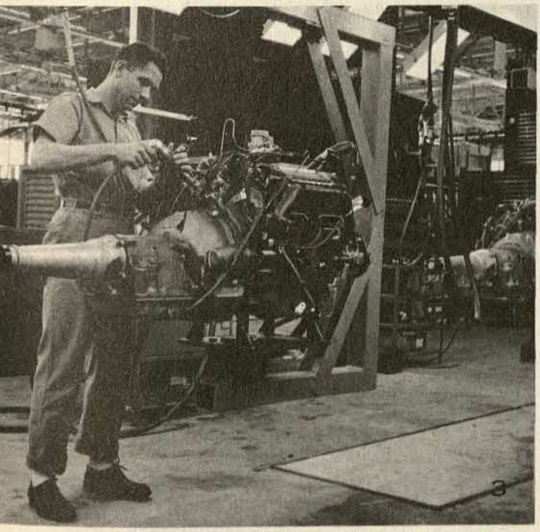
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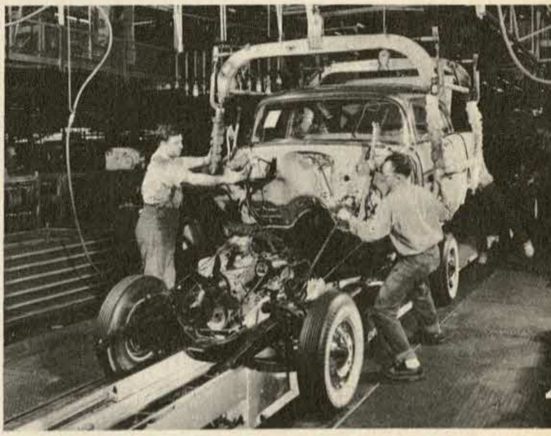
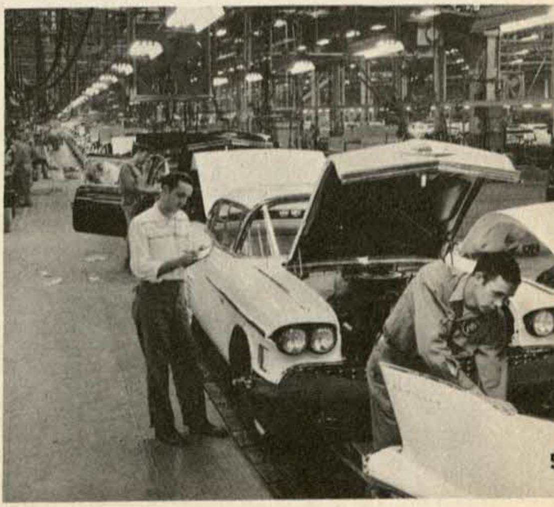




Courtesy General Motors Corp., Detroit, Mich.

MASS-PRODUCTION METHODS

(*1*) Assembly-line workers attach the rear leaf spring to the frame, one of the first final-assembly operations performed on the chassis. (*2*) Automation reduces time and increases accuracy in machining processes. Here multiple drill presses automatically bore holes in both sides of V-8 engine blocks. (*3*) At a subassembly station, a worker prepares a V-8 engine for mounting on the chassis. (*4*) In the "body shop," a car body (note the overhead conveyer) is joined to the car frame, by now equipped with engine and wheels. (*5*) In the final assembly line, completed cars are inspected before being driven off under their own power uses the exhaust to drive a propeller shaft. Another innovation in automobile engineering is the fuel-injection engine, in which gasoline is sprayed directly into the cylinder, thus eliminating the carburetor. This type of engine is said to use less fuel and to provide greater power. But it requires costly controls and thus far has not been used in large volume.

Other engineering developments of recent years include air suspension, in place of metal springs; dual headlights, for greater visibility; the limited-slip differential, which sends power to the wheel with the most traction; and economy-type carburetors, which use less fuel. Much development work is also going into lightweight aluminum engines, one or more of which may go into mass production.

Improved durability of American cars is reflected in the average age of cars scrapped. In 1925 the average age was 6.5 years; by 1957 the average age of scrapped cars had risen to 12.3 years.

DISTRIBUTION: Public taste in cars has often shifted rather suddenly. Until 1957, American car producers encountered little or no competition from the makers of European small "economy" cars. This lack of competition encouraged American manufacturers to make cars longer, wider, and higher powered, even in the low-priced categories. About 1956, however, it became noticeable that small imported cars were enjoying increasing sales in the U.S. In 1957 sales of such cars more than doubled, while the American Rambler, a compact car with a wheelbase *ca.* 10 in. shorter than those of other American low-priced cars, also enjoyed a wider market. Such small European or compact American cars, however, still accounted for only 10 per cent of the U.S. market in 1958.

Quick shifts have also occurred in the popularity of automobile body types. The rise of the closed car in the late 1920's drove open cars virtually off the market for some years save for luxury-type "convertibles." Again, between 1954 and 1956 the number of two- and four-door sedans produced in the U.S. declined by more than 900,000 units, while the number of station wagons produced nearly doubled (to 638,000), and the number of "hard-tops," sedans with lines resembling those of convertibles, doubled (to 1,823,000).

In the past 60 years more than 2,200 different brands of cars have been built in the U.S. at one time or another. Failure of the various companies resulted from many reasons, among them inadequate financing, poor distribution facilities, high manufacturing costs, and failure to keep up with competition in styling or engineering. Today, only five separate manufacturers of passenger cars remain in the U.S. The "Big Three"—General Motors, Ford, and Chrysler—account for nearly 90 per cent of sales in each of the three major categories: low-, medium-, and high-priced (luxury) cars.

Until recent years, exports of American-made cars exceeded European imports by a wide margin. But by 1957 imports of European cars, including many small, low-priced types, were running at the rate of somewhat over 200,000 a year, or slightly in excess of American-made exports. Total value of American automotive exports, including cars, trucks, and parts, however, rose by 1957 to $1,500,000,000, an all-time high.

SOCIAL EFFECTS. Besides its "opening out" of American living habits and widening the distribution of goods, previously mentioned, the automobile has had several side effects on American life. Automobile traffic deaths have mounted steadily for many years, with the increase in the numbers of vehicles and the rise in maximum speeds. Better roads, together with improvements in automobile engineering, have helped to control the number of accidents. In 1956 traffic deaths in the U.S. rose to 39,600, but declined in 1957 to 38,170. Such fatalities, measured in relation to the total number of vehicle-miles traveled, have been declining steadily. Compared with 30 years ago, the number of traffic deaths per vehicle-mile has declined by more than 50 per cent. The American motorcar accident rate, expressed in vehicle-miles, is well below that of most European countries.

The already well-established American habit of installment buying has been encouraged in recent years by the distribution problems of this competitive industry. The number of U.S. car and truck dealers declined from 45,700 in 1955 to 42,400 in 1957, as profit margins shrank. The nation emerged from World War II with a severe car shortage because of the total stoppage of private-car production during the war years (1942-45). In the early postwar years, car sales boomed, but, as the demand gradually became satisfied, profit margins of dealers slipped. The offering of longer credit terms with smaller down payments considerably widened the market. The ratio of cars sold on the installment plan to total sales rose from 46 per cent in 1950 to 64 per cent in 1956.

Aside from its utility, the automobile has a strong hold on hobbyists of various kinds. To satisfy the desire for fast driving, and for racing, sports cars and "hot rods" are bought or built by many. Hot rods, particularly popular among young men, are cars whose performance is improved by the addition of various added parts, such as specially engineered carburetors and dual exhausts. Other hobbyists collect and restore "antique" or early-model cars. Automobile races, which formerly contributed much to car and engine design, are still widely popular and attract thousands of visitors annually. See *Speed and Distance Records* for automobile racing records.

Labor relations in the automobile industry have often been stormy, especially since 1936, when unions at last succeeded in organizing leading plants in Detroit, long known for policies of "rugged individualism." Collective-bargaining agreements between the companies and the United Auto Workers since then have frequently represented breakthroughs on new types of demands, such as pensions, supplemental unemployment benefits, annual productivity increases, and cost-of-living "escalator" clauses.

FUTURE PROSPECTS: Automobile manufacturers in recent years have been experimenting with new types of engines, including jet turbines and fuel-injection systems, which may prove more flexible or more efficient. Thought is also being given to electronic controls, which could automatically guide cars on the highways or prevent collisions if the drivers' attention wanders. Also under study is increased use of foamed plastic cushioning to absorb the shock of collisions and thus make cars safer.

The automobile industry's policy of making extensive changes in styling and engineering each year has sometimes been criticized as wasteful and as contributing only to "conspicuous consumption." Such changes require the investment of hundreds of millions of dollars each year in retooling. The makers, however, argue that by improving cars each year and by creating styling obsolescence, they have created a much larger new-car market than exists in foreign countries regardless of their manufacturing capacities. The American company which fails to change its styling in any year usually finds that it has lost ground to its competitors.

Autonomic Nervous System (*a̤-tô-nŏm'ĭk*). See *Central Nervous System; Nerves.*

Autonomy (*a̤-tŏn'ô-mȳ*), the self-government of a city, district, or state. The term probably originated in ancient Greece, where most of the cities were independent and self-governed.

Autoplasty (*a̤'tô-plăs-tȳ*), a surgical operation in which lesions are repaired by using tissues taken from another part of the body to supply deficiencies caused by disease or wounds. Operations of this kind are performed to restore the use of an organ or improve the appearance. The parts taken may be from the same or some other individual. In many cases skin is taken from the body of an individual to repair lesions resulting from scalds or burns, or in the case of harelip. In India autoplasty was practiced in ancient times and it is referred to by Celsus, but in Europe and America it is a comparatively recent technique.

Autopsy (*a̤'tŏp-sȳ*), examination of a body to determine cause of death or organic alterations resulting from injury, disease, etc. Such examinations are usually conducted by a medical examiner or coroner.

Autumn (*a̤'tŭm*), the season of the year which follows summer. It is also called fall, this name arising from the falling leaves which characterize the season. In the Northern Hemisphere it extends from about Sept. 22 until Dec. 22, from the autumnal equinox to the winter solstice. In England it embraces the months of August, September, and October, while in America the autumnal months are September, October, and November.

Auvergne (*ō-vĕr'ny'*), an ancient province of central France, now merged into Cantal, Puy-de-Dôme, and part of Haute-Loire. The region is traversed by the Auvergne Mts., a branch of the Cévennes Mts.; their peaks are the highest of central France. Among the loftiest summits are the Puy de Sancy, 6,185 ft., the Puy-de-Dôme, 4,805 ft.; and the Plomb du Cantal, 6,095 ft. There are deposits of coal, copper, iron, and lead, and numerous mineral and thermal springs. The mountain slopes are covered with a fine growth of grass, while the valleys are rich in fruits, cereals, and livestock.

Auxiliary Verb (*a̤g-zĭl'yȧ-rȳ*), in grammar, a verb which, usually preceding another, serves to indicate tense, etc., *e.g.*, be doing, do come, have written, must see; in each case, the first given being the auxiliary verb.

Ava (*ä'vȧ*), the former capital of Burma, on the Irrawaddy River, opposite Mandalay, the present capital. It is surrounded by walls and has several Buddhist temples. Formerly it was a large city and commercial center, but it was destroyed by an earthquake in 1839. The region is rich in ancient ruins.

Avalanche (*ăv'ȧ-lănch*), the name applied to masses of ice or snow that slide down the sides of mountains to lower levels. These masses differ somewhat in the nature of the falling material, this depending upon climatic conditions and the season of the year. Drift avalanches consist of dry or loose snow set in motion by the wind, and in falling or sliding accumulate larger masses in the descent, finally reaching the valley in clouds of dustlike snow. This class occurs in the cold seasons, and is attended by danger on account of a liability to destroy animals and buildings. Avalanches of a somewhat different character occur in the spring and at the seasons of melting snows. These cause the sod to be detached and carried with the snow down the mountainside, and in falling frequently create a draught of wind sufficiently strong to destroy buildings and even forest trees. Ice avalanches consist of ice masses that detach from glaciers in upper regions and slide with great force down the mountainsides. The latter class are most common in the Alps of Europe, where much property and many lives have been lost on account of their damaging effects. A class of avalanches called snowslides occur in the Rocky Mts., where they frequently form an obstruction to railroad trains. The term is also applied to landslides, which arise from quantities of earth becoming loosened near the upper part of an eminence and sliding to a lower elevation.

Avalon (*ăv′à-lŏn*), in Celtic mythology, a kind of earthly paradise, from which many heroes were said to have come. King Arthur, the main figure of the Arthurian legend, was brought there after his last battle. In medieval poetry, it became the symbol of a fantastic region of miraculous occurrences. Its identification with the "Isle of Saints," where the Abbey of Glastonbury, England, was erected, is entirely legendary.

Ave Maria (*ä′vâ mâ-rē′ȧ*), meaning hail Mary, a form of address used among Roman Catholics in addressing the Virgin Mary, as an expression of honor and when requesting her intercession. It is usually coupled with the recitation of the Lord's Prayer and is repeated three times each morning, noon, and evening at the ringing of the bells known as the Ave Maria or *Angelus Domini*. The term came into use from the salutation of Mary by the Archangel Gabriel, Luke 1:28, and the form of address was sanctioned by a papal edict in 1326. Pope Pius V ordered the daily use of the whole prayer in 1658, consisting of the three parts: 1, "Hail Mary, full of grace, the Lord is with thee"; 2, "Blessed art thou, among women, and blessed is the fruit of thy womb"; 3, "Holy Mary, mother of God, pray for us sinners now and in the hour of our death."

Courtesy The Bettmann Archive, N.Y.

"THE ANGELUS"

Painting by Jean François Millet (1814-75)

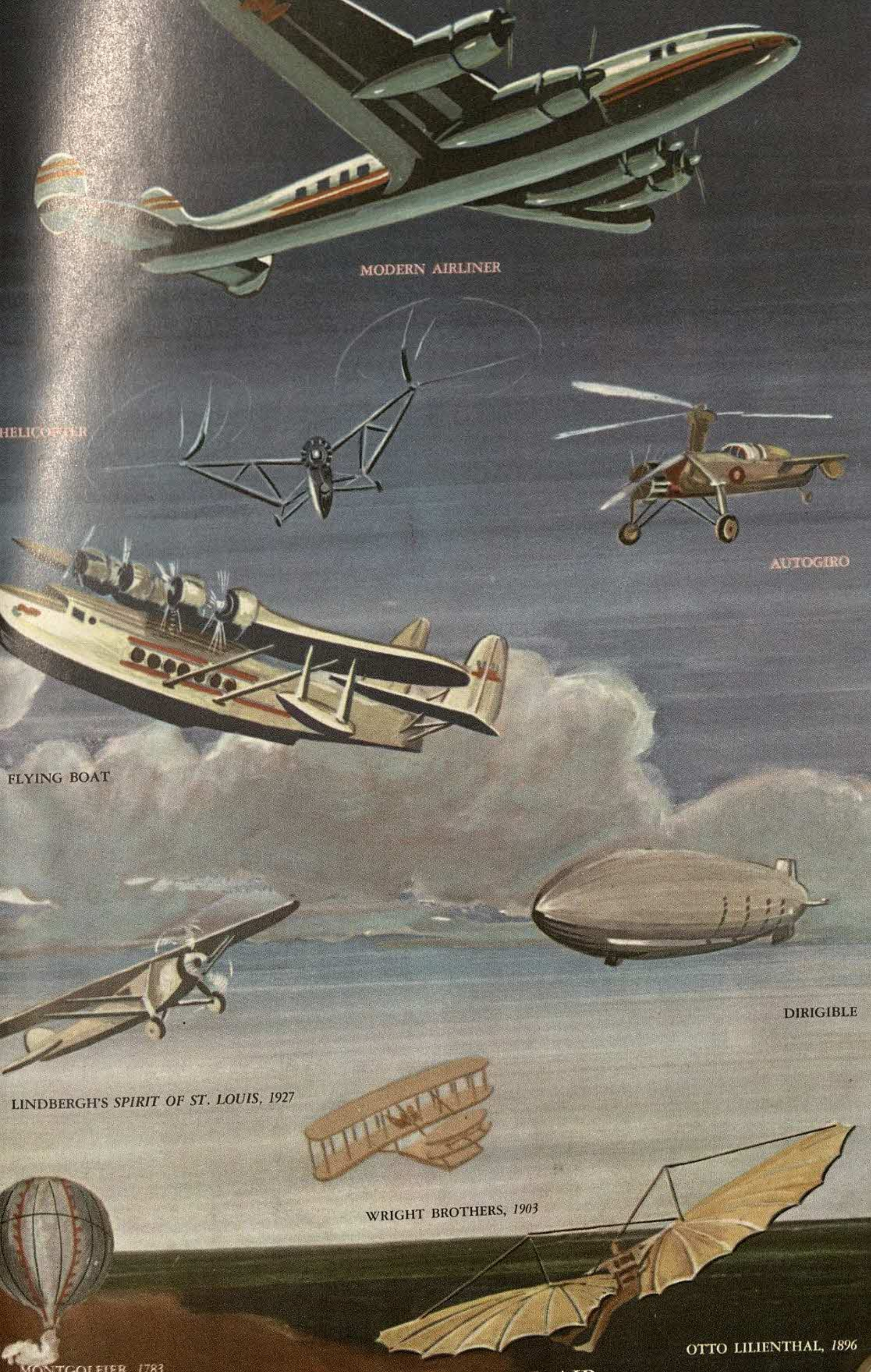
Average (*ăv′ĕr-ĭj*), the mean proportion between two certain given quantities. To obtain the average the given number of quantities are added, and the sum is then divided by the number of quantities given. For instance, to find the average number of days in the months, add the days of the months, which, in a year not a leap-year, equal 365, then divide by 12; the quotient is the average. In a similar way the averages of different quantities may be ascertained.

Avernus (*ȧ-vĕr′nŭs*), a small lake in Italy, about 8 m. w. of Naples, and now called Lago d'Averno. It occupies the crater of an extinct volcano, is a mile and a half in circumference, and about 190 ft. deep. There is no natural outlet, but Agrippa made an artificial passage for its overflow into the Gulf of Baiae. Since then the passage has been closed up by volcanic action, and there is now no visible outlet. The scenery around the lake is wild and grand, and at various times sulphurous vapors arise, circumstances by which the people in ancient times were led to believe that Lake Avernus was the entrance to the infernal regions. It was dedicated to Proserpine, and, according to legend, Ulysses frequently visited there the ghosts of the dead. On the south side of the lake is a formation mentioned as the grotto of the sibyl, and near it are ruins of a temple dedicated to Apollo.

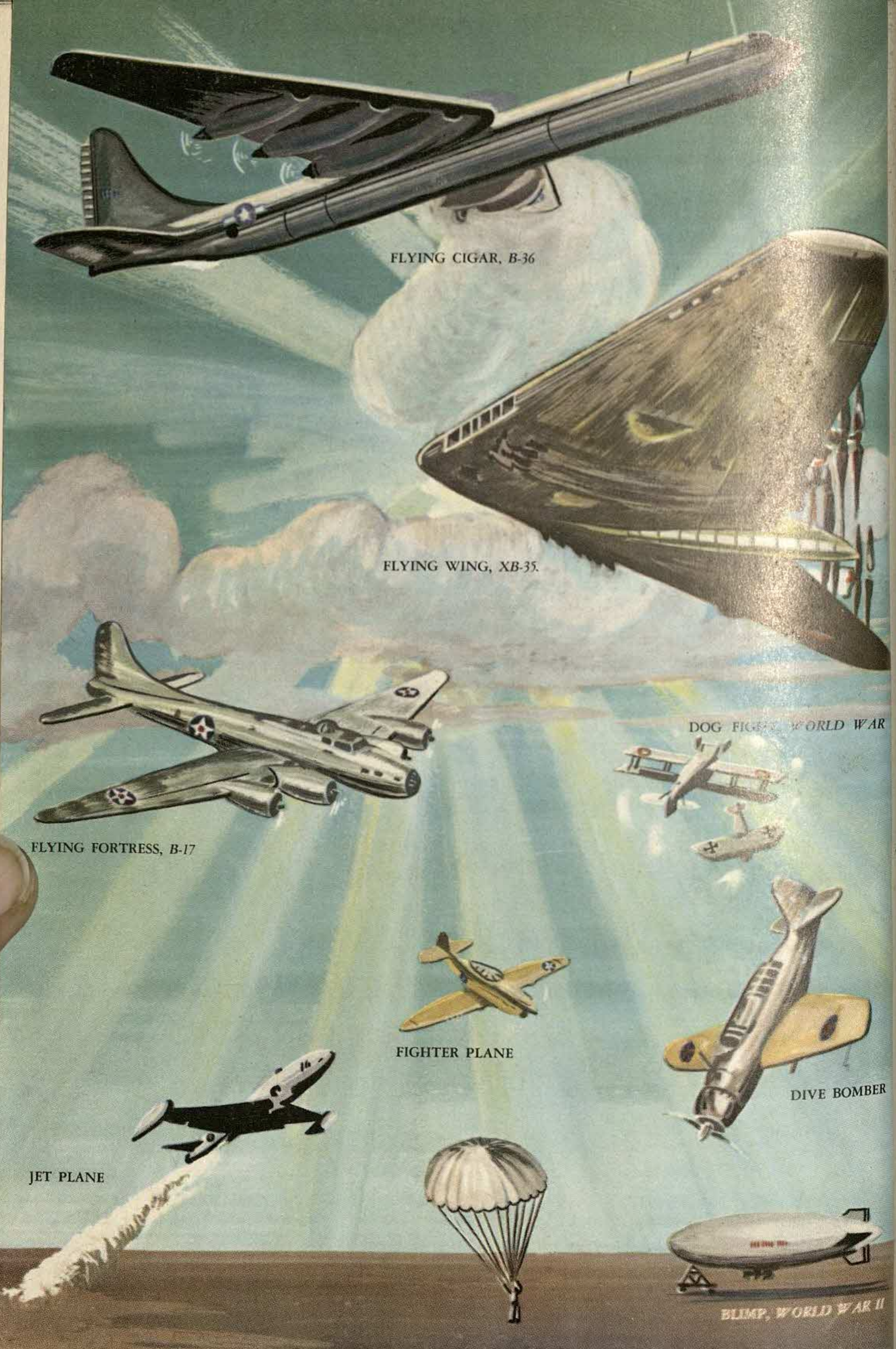
Averroes (*ȧ-vĕr′ō-ēz*), or AVERRHOES, philosopher, born in Cordoba, Spain, in 1126; died in Morocco in 1198. He was judge in Seville and Cordoba, later becoming physician-in-ordinary to caliphs. Greatest among Islamitic philosophers, he devoted himself primarily to commenting upon the writings of Aristotle, deeply influencing the philosophy of the Christian Middle Ages and of the Renaissance. His works deal with philosophy as well as with jurisprudence, medicine, astronomy, and grammar.

Avesta (*ȧ-vĕs′tȧ*), or ZEND-AVESTA, the sacred scriptures of the religion of Zoroaster, and in use by the Parsees as their Bible. The French scientist, Anquetil Duperron, translated it in 1771. This work in size is about one-tenth of our Bible, and at least portions of it date from remote antiquity. The Avesta represents the oldest faith of Iran and was the law of ancient Media and Persia. See *Parsees*.

Aviary (*ā′vĭ-â-rў*), an inclosure for breeding, rearing, and keeping birds. The first mention of aviaries is in connection with the ancient Persians, but later like structures were built in Greece and Rome, and in the 16th century similar inclosures were constructed in Western Europe. Excellent aviaries are now maintained in many of the zoological gardens of America and Europe, and in them may be seen beautiful birds of song and plumage from many climes.



MAN MASTERS THE AIR



MILITARY AVIATION

Aviation (*ā-vĭ-ā'shŭn*), the science and art of locomotion or travel above the earth's surface. Aviation includes *aeronautics* (within the earth's atmosphere) and *space travel* (outside the earth's atmosphere). Aeronautics includes *aerostatics* (the science of buoyant vehicles such as gas-filled balloons) and *aerodynamics* (the science of heavier-than-air vehicles).

Although Hero of Alexandria discovered the principle of the jet-reaction engine more than 2,000 years ago, and Galileo wrote the primer of modern physics late in the 16th century, man began to conquer the air only late in the 18th century.

Two world-wide wars in the first half of the 20th century lent fresh significance to all phases of aviation. Air power, symbolized by the military airplane, grew into a political instrument of force without precedent in history. During the second of these two wars the manufacture of aircraft became the world's largest single industrial enterprise. Millions of persons flew who never had flown before; technical advances in aircraft design gave promise of affording flight to many millions in the future.

AIRCRAFT TYPES

Aerostatic aircraft rise because, filled with low-density gases such as hydrogen or helium, they are lighter than air. Aerodynamic aircraft rise on account of the action of air under velocity on their lifting surfaces or airfoils. (See Theory of Aerodynamic Flight, later in this account.) By far, aerodynamic aircraft have done more of the world's work than any other type of flying machine.

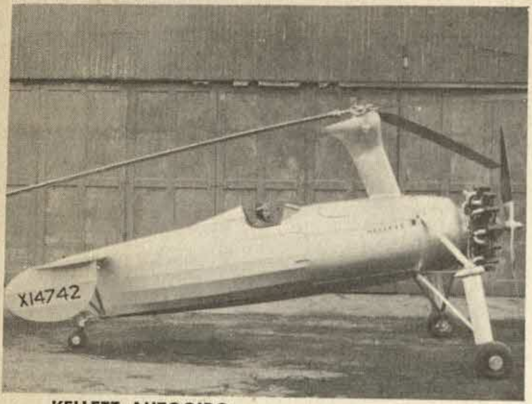
Aerodynamic aircraft, heavier than air, can be divided arbitrarily into several classifications. Some are single-engine equipped, some multi-engine. Some, like gliders (see later this account) and sailplanes, have no engines at all. Some (fixed-wing aircraft) fly by establishing enough horizontal velocity in a run across the ground to induce a lifting action on the wings. Some fly from a standing start by the mechanically induced rotation of a collection of elongated wings fastened to a hub, the entire assembly being called a rotor.

Fixed-wing aircraft are the most widely used. They consist of a fuselage, or body; a wing or wings as sustaining surfaces; a tail group or empennage containing stabilizing and control surfaces; and one or more engines. The engines may turn propellers or they may drive the aircraft by jet reaction. Other control surfaces called ailerons are attached to the wings, normally on the outboard trailing edges. Most fixed-wing aircraft are *monoplanes;* that is, they have only one wing instead of the two wings, set one above the other, of *biplanes*. During World War I, planes with three or more wings, set one above the other, were developed, but they were abandoned because monoplanes proved to be more efficient. Monoplanes are subdivided into three classes, high-wings, mid-wings, and low-wings, according to the position of the wing with respect to the fuselage. Aircraft can have three kinds of landing gear: wheels, skis, and flotation gear such as pontoons or a boatlike hull. Wheels are employed for normal ground landings and take-offs, skis for terrain covered with ice or snow, and pontoons or hulls for water. In hull-type aircraft the hull serves both as a fuselage and as landing gear.

Rotating-wing aircraft is the other general classification of flying machines that achieve flight by the application of power. In this type, the helicopter, the fixed wing of the conventional aircraft is replaced by a series of two or more blades, similar to the blades of a propeller, operating in a horizontal plane several feet above the fuselage. The whirling of the rotor blades at only a few hundred times a minute provides the same lift as that imparted to a fixed-wing plane by the rapid forward movement of the wing

DAEDALUS AND ICARUS

This sculpture from the Villa Albani (Rome, 1758), illustrating the myth of Daedalus, who made wings for himself and his son Icarus, symbolizes man's age-old desire to conquer space (*courtesy Bettmann Archive, N.Y.*)

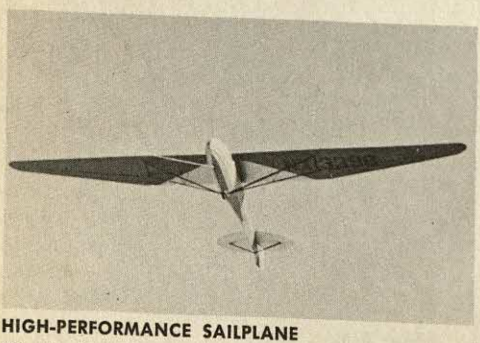


KELLETT AUTOGIRO

This autogiro had a conventional propeller in front, but rotating blades took the place of the customary wing. Autogiros in recent years have been superseded by helicopters (*courtesy Bond Bros., Pa.*)

through the air. In the 1930's Juan de la Cierva, a Spanish inventor, introduced a free-wheeling rotor system on an aircraft propelled by a conventional engine and propeller. Although this machine, the "Autogiro," proved inefficient, its relative success lent impetus to further experiments on helicopters. Helicopters apply their engine power directly to the rotor assembly; they have no propellers working in a vertical plane for horizontal flight. Helicopters can have more than one main rotor; in that event they are said to employ a balanced-rotor system. In the single main-rotor type they often employ a smaller rotor, working in a vertical plane, in the empennage. In the event of engine stoppage a helicopter's rotor blades will auto-rotate through the actuation of an over-running engine clutch, thereby giving the rotor the function of a parachute for safe landings.

Gliders or engineless aircraft are constructed substantially like fixed-wing aircraft. They have the same lifting, stabilizing, and control surfaces. Often, in addition, they are fitted with small auxiliary control surfaces on the top surfaces of their wings, called "spoilers"; these are employed in landings for quicker descents, as they interrupt the flow of air across the wings and reduce their lift. Most gliders can only "coast downhill." They can be launched with a tow-rope attached to a drum and actuated by a gasoline engine, by the stretching and release of an elastic cord called a "shock cord," or by being towed aloft by a powered aircraft. Some gliders are capable of sustained flight. These are called *sailplanes* or high-performance gliders. Sailplane pilots can sustain themselves by seeking upward currents of air such as are encountered below masses of cumulus (fair weather) clouds (*q.v.*) and on the windward side of hills and mountains. Flights of many hundreds of miles have been made by expert sailplane pilots, and gliders played an important role in military aviation in World War II.



HIGH-PERFORMANCE SAILPLANE

Heavier-than-air craft can fly without engines, float, and climb on upward-moving currents of air. Here a sailplane is being launched by a tow-rope which will cut loose when the plane has attained sufficient altitude (*courtesy Aviation Magazine, N.Y.*)

The *powered glider,* an aircraft with glider characteristics but fitted with small engines that enabled it to fly short distances once it had been towed into the air, made its appearance in both Germany and the U.S. before World War II. A large troop-carrying aircraft, dubbed a powered glider, was used sporadically by the German military during the war in behind-the-lines operations.

THEORY OF AERODYNAMIC FLIGHT

A lifting surface, or wing, is known as an airfoil. It is not a flat surface at all but a shape containing some highly complex curves. The leading edge of a wing is bulbous, the trailing edge knifelike. Roughly a wing resembles a tear drop. From the leading edge backward the top of a wing describes a convex curve for about a third of its width, or chord. Thereafter it slopes in a relatively straight line to the nether end of its chordline. The curve, which accounts for about 60 per cent of a wing's lift, is called the camber. The bottom surface of a wing conventionally is flat or, in some instances, slightly concave. Successful wings have been flown, however, incorporating a double camber, or having convex curves on both the top and bottom surfaces. About 40 per cent of a wing's lift is ascribed to the bottom surface. The lift on the top surface is established when air under velocity is introduced to the leading edge. As it strikes the wing the air is divided into two flows, one over the top, the other underneath. The air on top is forced up by the camber. At a point of greatest thickness a partial vacuum develops. Air coursing along the bottom of the wing pushes upward in an effort to fill the vacuum on top, thereby developing lift. The remainder of the lift, ascribed to the under surface of the wing, is due to the normal pressure of the air flowing along that surface.

All airfoils, including those of propeller blades and the rotor blades of rotating-wing aircraft, are subject to the same mechanical action of the air as that bathing the wings of fixed-wing aircraft. The rules governing such action are known as the laws of fluid dynamics. Students of the theory of flight regard air as a fluid, just as mercury and water are fluids. Aerodynamic aircraft will develop lift only when air is introduced to them under velocity.

Fixed-wing aircraft encounter air under velocity when they are propelled through the air by mechanical means or, as in the case of sailplanes and gliders, when they employ gravity to attain velocity or fly in areas where the air is in rapid motion. The conventional propeller-driven airplane attains lift, and therefore is able to fly, only through a complex system of power translations. An engine, burning fuel, turns a crankshaft to which a propeller is attached. The propeller thrusts the aircraft forward. In gaining momentum the wings encounter air under velocity. That produces lift. The energy originally contained in the fuel is so dissipated in the stages intermediate between burning and induced lift that only a small portion of it actually is utilized for flight.

Aircraft are controlled by the throttle-setting of the engine or engines and by the control surfaces. A stick or control wheel in the cockpit raises and lowers the ailerons in converse motion; to lower the left wing, for instance, the pilot moves his control to the left. That raises the left aileron on a hinge fitted to the wing's trailing edge and lowers the right aileron. Air under velocity striking the upraised left aileron depresses that wing, while air striking the lowered right aileron raises that wing. The ailerons, it is apparent, thereby control the aircraft on its longitudinal axis of rotation.

The same cockpit stick or control wheel actuates the elevators in the empennage. When the pilot pulls back on his control the elevators, hinged to a fixed surface known as the horizontal stabilizer, are raised. Air striking the upraised elevators depresses the aircraft's tail and points the nose upward. The elevators thereby control the aircraft on its lateral axis of rotation.

Rudder pedals actuate the rudder in the empennage, hinged to the "fin" or vertical stabilizer. If the pilot wishes to turn left, he pushes on his left rudder. The rudder swings to the left. Air striking that surface swings the tail to the right and the nose of the aircraft to the left. The rudder thereby controls the aircraft on its vertical axis of rotation. In theory, aircraft would need no rudder at all; the ailerons alone, by depressing a wing, could turn the aircraft and control the direction of flight. In fact, successful aircraft, with large fin areas, have been flown. In practice the rudder is employed to overcome what engineers know as "yaw," or the tendency of an aircraft to turn in a direction opposite to that in which the wing is depressed. Yaw results from the stream of air flowing past the empennage and resisting the effort of the fin to swing properly in a direction opposite to that in which the pilot wishes to direct his aircraft. Not all fixed-wing aircraft, however, have such conventional control surfaces, or surfaces affixed in that manner. Tailless aircraft have been constructed on which a portion of the wingtips is bent downward to achieve horizontal stability and ailerons provide their normal function of lateral control. Such aircraft employ no rudder.

Flaps, or air brakes, are known as high-lift devices. Hinged to the trailing edge of the wing, inboard, they are lowered sometimes on take-off to give the wing added lift momentarily. Their principal function, however, is to reduce the landing speed. When flaps are applied in the landing maneuver, they not only supply added lift to the wing but they also act as a brake to slow the plane's speed. Some of the newer jet transports have an added control surface, the same spoilers that are used on sailplanes. Raised on the upper surface of the wing simultaneously with the upward motion of the aileron, they diminish the lift and afford a more precise control of an aircraft around the longitudinal axis. Slots are openings, outboard, immediately in front of, or just aft of, the leading edge of the wing. When a wing is at a high angle of attack (climb), the ailerons begin losing their effectiveness because of a burbling of the air on the top surface. Air flowing through the slots re-establishes some of the ailerons' effectiveness.

Substantially the same movements govern gliders, sailplanes, and rotating-wing aircraft as govern fixed-wing aircraft.

Though, in the cockpit, helicopter controls are similar to those of fixed-wing aircraft, their movements actuate entirely different control surfaces. The helicopter pilot has a control stick or wheel, rudder pedals, and a throttle but, in some versions of the helicopter, he also has a control known as a multiple pitch changer. The rudder pedals control a conventional rudder, as in standard versions of the balanced (or two- or multiple-rotor) helicopter, or they control the supplemental rotor in the empennage working in a vertical plane. This supplemental rotor serves a dual purpose: by changing pitch or actually reversing its pitch it controls the aircraft on its vertical axis, and it is a compensator for the tendency of the body of the aircraft in the single-main-rotor type to turn in a direction opposite to that of blade rotation. This tendency is known as *torque effect*. The cockpit stick or control wheel actuates either the tilting device in the rotor head or heads (depending on the number of rotors employed) or a system of

SHORT-HAUL AIR TAXI AND TRUCK

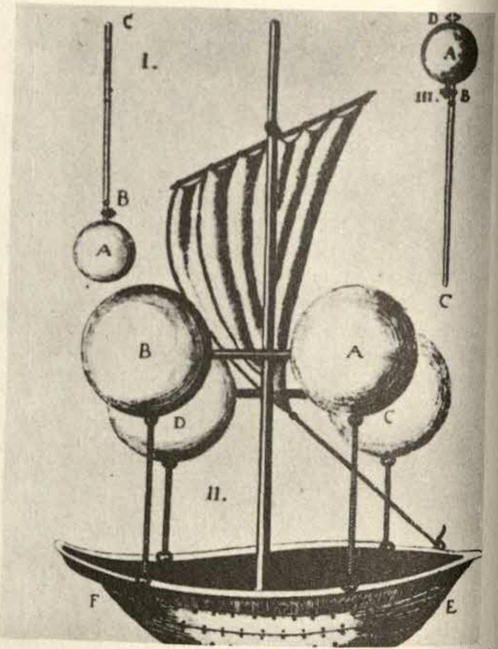
The helicopter transport has now become a fixture in the air transportation systems of the world's larger cities. The operations of this one, flown by New York Airways, are typical—carrying passengers, baggage, mail, and express between airports of the metropolitan area. It can carry 15 passengers (*courtesy New York Airways, N.Y.*)

blade-changes in the lifting rotor during the 360-degree circuit of the rotor head. By the Sikorsky Aircraft Division of United Aircraft Corp., producer of some of the most successful helicopters, this system is known as "cyclic pitch control." Horizontal movement of a helicopter is achieved either by tilting the rotor head or by the cyclic pitch method. In the first, the disc described by the blades in their circuit of the hub is inclined slightly toward the line of flight. In the second, the rotor blades change pitch in opposite quadrants of their circle around the hub; for forward flight, for instance, the pitch of the blades in the quadrant in front of the pilot is flattened and the pitch in the quadrant behind him is increased. The fourth control changes the pitch of all the blades simultaneously. The pilot desiring to rise, descend, or hover without horizontal movement of the aircraft can do so by manipulating the blade pitch and accommodating the engine speed to the load so imposed on the rotor.

HISTORY

It can be said that aviation began before the time of Christ when the Chinese invented an aerial top, a plaything that incorporated some of the principles used in helicopters. Men worked on the problem of human flight for uncounted centuries before achieving it. Francesco de Lana, about 1670, propounded the idea that man could fly if he could construct a vacuum balloon, buoyed upward by copper spheres from which the air had been exhausted. He argued that "no air" would be lighter than "some air" and therefore that the spheres would rise. He failed to recognize the fact that if the spheres were made strong enough to resist the weight of air in their external surfaces, they would be too heavy, despite their vacuum within, to rise.

Two brothers, Joseph and Etienne Montgolfier, late in the 18th century demonstrated passengerless flight with balloons containing hot air. The balloons rose simply because the heated air was rarer, and lighter, than the air around it. Hot-air flight was employed extensively by county fair exhibitioners for many years in the U.S., and indeed as late as the first decade of the 20th century. The first human flight on record—though some historians insist that the Italian painter-sculptor, Leonardo da Vinci,[1] attempted flight in a heavier-than-air machine in the year 1506—occurred outside Paris in 1783. Jean-François Pilatre de Rozier and a friend, the Marquis d'Arlandes, ascended in a hydrogen-filled balloon and remained aloft for about 23 minutes. Ballooning grew in popularity but not a great deal in usefulness during the ensuing century. Benjamin Franklin, on hearing of the feat of human flight, wrote that here was a weapon that might end all wars—for what prince existed who could afford such a vast dis-



THE BALLOON THAT BURST—17th CENTURY

Francesco de Lana, Italian monk, designed a boatlike contrivance suspended from four evacuated copper balls. He argued that no air would be lighter than some air, and therefore the vacuum balls would rise. Outside air pressure, however, collapsed the balls and, with them, his dreams of flying position of troops as to prevent the landing of an aerial army in his realm? Napoleon Bonaparte proposed, but never acted on, the suggestion that England could be invaded successfully by a balloon-borne army.

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[1] Leonardo da Vinci, in fact, designed fixed-wing as well as rotating-wing aircraft.

Until the invention of the engine-driven gas bag (see *Balloon*) lighter-than-air craft had little or no utility except as observation platforms in military operations. They were used as such during the U.S. Civil War.

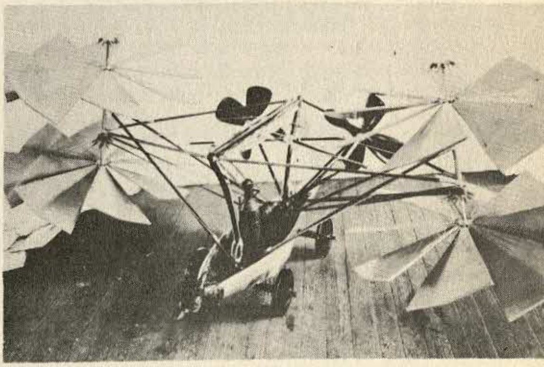
Many attempts have been made to fly as the birds fly. The flapping-wing aircraft, known as the *ornithopter,* claimed the attention of scientists for many years, but none ever was successful. A vogue for flapping-wing experiments grew up in the late 19th century. A patent was issued (1889) to one R. J. Spaulding for wings to be fitted to the arms and legs of a man, and as late as the 1930's Italy experimented with muscle-actuated flapping-wing flight.

Late in the 18th century experiments were carried on in England with versions of the Chinese top, and throughout the following century scientists toyed with the idea of achieving vertical (or direct-lift) flight. A helicopter bomber was proposed during the American Civil War to break the Union blockade of Confederate ports. Meantime efforts were made to fly with heavier-than-air devices. Sir George Cayley, "father of British aeronautics," succeeded as early as 1810 in sustaining himself in the air for very brief periods with fixed wings, a rudimentary glider. Ballooning and gliding could be said to have developed concurrently. As vehicles for human flight, the balloon and the glider appeared to offer the most promise. A German, Otto Lilienthal, was a substantial contributor to the development of the principles of heavier-than-air flight. He made several thousand flights in gliders before he was fatally injured during a test flight in 1896. It was he who laid down the principle that a wing must be cambered (be provided with a convex curve on its upper surface) to provide controlled lift. Lilienthal had followers in Europe, South America, and the U.S. In America gliding experiments were carried on by the Montgomery brothers in California, Octave Chanute, and others late in the 19th and early 20th centuries.

In the experiments of two Dayton, Ohio, brothers, Wilbur and Orville Wright (*q.v.*), owners of a bicycle shop, began the culmination of man's attempt to fly in a vehicle heavier than air. They had become intrigued with the widespread glider experiments that had been going on. Like others, interested in flight, they recognized that one of the chief problems confronting those studying the problem of flight was control. Lilienthal controlled his gliders in the fluid medium of the air by shifting his weight to give direction and balance to his aircraft. The Wrights mulled the idea over. They arrived at the conclusion that they could achieve control by warping the wings. If the rear outboard part of the right wing were depressed, they reasoned, that wing would rise and cause the aircraft to turn on its longitudinal axis. From that point they progressed to the problem of installing power in a glider to drive it through the air and make it useful as a conveyance that could transport a person from one point to another. During the latter part of the 19th cen-

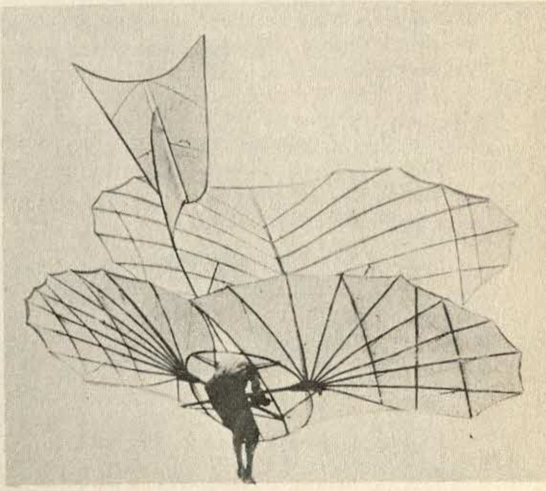
THE MODEL WORKS—EARLY 18th CENTURY

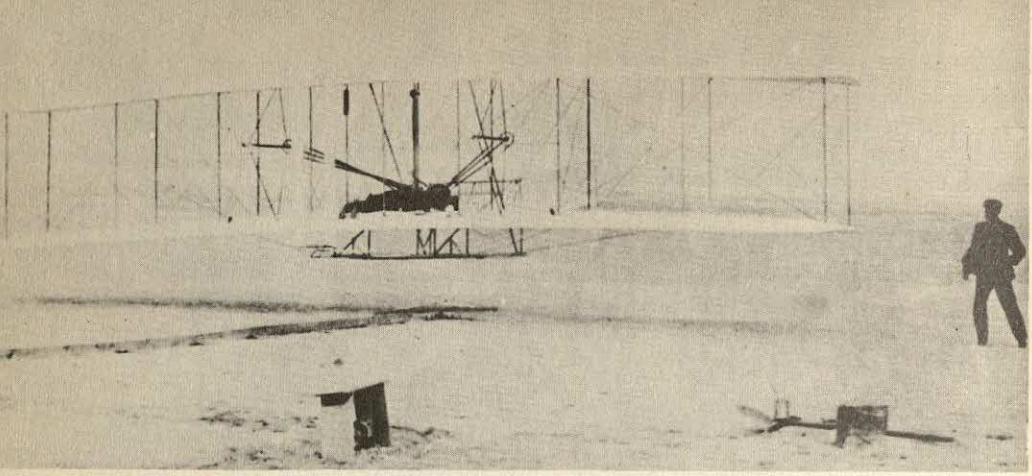
Sir George Cayley, "father of British aeronautics," designed a machine that looks not unlike today's twin-rotor helicopters. He proposed to drive the contrivance with steam but never progressed beyond the construction of a model (*courtesy Smithsonian Institution, Washington, D.C.*)



THE GLIDER FLIES—LATE 19th CENTURY

Preceding the development of a powered heavier-than-air machine capable of carrying a man there was much work on gliders, the direct forebears of today's gliders and sailplanes. Otto Lilienthal, famous German glider expert, is shown "coasting downhill" in a biplane glider, the kind of flight that cost his life (*courtesy The Museum of Modern Art, N.Y.*)





TWELVE SECONDS ALOFT—WRIGHT BROTHERS

The most famous flight in human history—that of Wilbur and Orville Wright at Kitty Hawk, N.C., on Dec. 17, 1903. Orville, at the controls, lies on his stomach on the lower wing; Wilbur runs alongside. The flight, first in a powered heavier-than-air machine with a man aboard, lasted 12 seconds (*courtesy The Museum of Modern Art, N.Y.*)

tury aircraft models had been flown by means of small power plants—mostly with steam engines—but no power-propelled aircraft that was heavier than air had carried a man.

The Wrights had much competition. Included among their rivals was Samuel Pierpont Langley of the Smithsonian Institution. For 17 years he worked with theories of flight, built flying models, and aspired to construct an aircraft that would carry a man. With the outbreak of the Spanish-American War, Congress appropriated $50,000 for Langley to carry on his experiments on his plea that a flying machine would be valuable as a military instrument. In his final effort to achieve success he launched his aircraft from the top of a houseboat in the Potomac River in October 1903. It had been launched unsuccessfully before, and this time too it crashed, carrying with it Langley's dream of a conquest of the air. Many years later one of America's pioneer airmen, Glenn Curtiss, rebuilt the Langley machine and flew it, but to this day controversy exists over the question whether Curtiss in rebuilding it made alterations outside the scope of Langley's work that enabled it to fly. The Smithsonian Institution exhibited Langley's machine as the first heavier-than-air craft capable of carrying a man.

While Langley worked to perfect his aircraft, the Wrights, transferring their operations to the sand dunes of North Carolina where they found strong prevailing winds, quietly evolved their own theories. Their gliders were notably successful, and on Dec. 17, 1903, the first recorded flight in all human history utilizing engine power and with a pilot at the controls, took place. The machine, with Orville Wright at the controls, flew for 12 seconds and traveled 120 ft. Before the day was over it had flown for 59 seconds at a time. Thus was the powered, heavier-than-air aircraft born. The achievement was not without a melancholy note. Late in the day a strong gust of wind caught the flimsy machine and turned it end over end, damaging it badly. But the Wright brothers were satisfied. They had proved their theories.

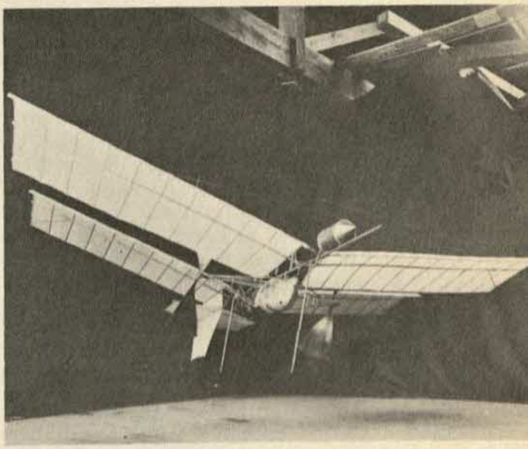
Partisans of the Wrights insist that the only profit to come out of the Langley experiments was an aircraft engine developed for Langley by a brilliant engineer named Charles H. Manly, who acted as the inventor's volunteer pilot. This engine, of the radial type—the cylinders were arranged in the shape of a star and delivered their power to a single main bearing in the center—was the direct forebear of today's high-horsepower engines that power most transport and many private planes. The Wright brothers continued to build aircraft, fighting for their acceptance by the U.S. armed services as being of potential military value. The original Wright plane lay in discard for many years. Rebuilt, it finally was placed on exhibition at the Massachusetts Institute of Technology. Then, while negotiations were in progress for sending the Wright plane to Washington to be preserved for posterity, an argument developed between Orville Wright and the National Museum in Washington over the wording of the placard on the Langley machine in the Smithsonian. In the end Orville Wright sent it to the Kensington Museum, London. Not until 1943 did the Smithsonian Institution agree to alter the wording of the placard on Langley's "Aerodrome" so as to give credit to the Wrights for the first flight in history. The Wright plane was returned to the U.S., and was enshrined in the Smithsonian on Dec. 17, 1948.

The airplane underwent progressive refinements in the years immediately following the Wright flight. By 1909, a Frenchman, Louis Blériot, had flown the English Channel. In America, Glenn Curtiss began gaining fame as an airplane designer and flier. In a world aeronautical meet at Rheims, France, he won a trophy for flying two laps of a closed course at a speed of 47.65 m.p.h. Returning to the U.S. he increased that speed to 55 m.p.h. That seems modest enough, in consideration of the fact that military airplanes today can fly almost 30 times that fast, but for 1910 it was an impressive speed. When Curtiss flew down the Hudson River from Albany, N.Y., to New York City to win a newspaper prize of $10,000, he established himself as the greatest American rival to the Wrights. Among his many contributions to the art and science of flying was the aileron control. The Wrights still used wing warping to "bank" their airplanes. The Curtiss system was not only simpler but more dependable.

Before the outbreak of World War I airplane speeds began approaching 100 m.p.h. Airplane flights thousands of feet into the air had become a commonplace. Just before the war began, an airplane, called the *"America,"* was being prepared for the first attempt at a trans-Atlantic flight. The start of hostilities put an end to those plans. For four years the history of aviation was the history of military flying. Then, in 1919, with the impetus to research given aeronautics by the war, there began fresh peacetime attempts to achieve new goals. Two Englishmen, John Alcock and A. W. Brown, flying a war-vintage bomber, crossed the Atlantic from Newfoundland to Ireland. A U.S. Navy flying boat, the "NC-4," flew from Newfoundland to the Azores and from there to Lisbon. By 1924, U.S. Army airplanes had flown completely around the world. As early as 1920, Maj. R. W. Shroeder of the Army established a world altitude record of 33,000 ft. By 1922, airplane speeds were up to 224 m.p.h. and still gaining. In the same year a world endurance record was established by two Army pilots at 35 hours, 15 minutes. In 1924, Russell L. Maughan spanned the U.S. between dawn and dusk. In 1927 began an era of ocean flying that electrified peoples the world over and began impressing on the public consciousness the versatility of the airplane as a commercial vehicle and a potentially major instrument of war. Charles A. Lindbergh touched off a long train of ocean-flying attempts, some forlornly unsuccessful, when he flew from New York to Paris, a distance of 3,600 m., non-stop in 33 hours, 39 minutes. A few days later, Clarence Chamberlin and Charles Levine flew from New York to Eisleben, Ger-

LANGLEY'S "AERODROME"

Some say that Samuel Pierpont Langley, one-time curator of the Smithsonian Institution, died of a broken heart when his "Aerodrome" failed to fly. His aircraft, a model of which is shown, crashed on an attempted take-off in the Potomac River in 1903 (*courtesy Smithsonian Institution, Washington, D.C.*)



LINDBERGH'S "SPIRIT OF ST. LOUIS"

Charles A. Lindbergh's airplane, "Spirit of St. Louis," is shown at the airport before its flight to Mexico City. This flight was made at the invitation of the Mexican president after Lindbergh returned from Paris and flew the famous plane on a tour of American cities

many, a distance of 3,900 m., in 42 hours, 45 minutes. In the same year, two Army lieutenants, Lester J. Maitland and Albert F. Hagenberger, flew from Oakland, Calif., to Honolulu, a distance of 2,400 m., in 25 hours, 50 minutes, and in 1928 Charles Kingsford-Smith flew from San Francisco via Hawaii and the Fiji Islands to Sydney, Australia, between May 31 and June 10, a distance of 7,400 m. Before 1930, both the arctic and the antarctic were explored by air. The first notably fast circumnavigation of the globe was accomplished by Wiley Post and Harold Gatty in 1931; they required only 8 days, 16 hours. Two years later Post followed the same route, cutting the time to 7 days, 19 hours. Howard Hughes and a picked crew flew around the world —following substantially the Post-Gatty route— in 1938 in 3 days, 19 hours. Meantime, world speed contests had been held periodically, and in the most famous of them, the Schneider Cup Races, a mark was set by an English pilot of 340.08 m.p.h. That record stood for three years until an Italian pilot achieved a record 440 m.p.h.; this record, in turn, was broken by Fritz Wendel, a German pilot, who flew for three kilometers at a speed of 469.2 m.p.h. The technical progress made during World War II also influenced aviation speed. A most noticeable cut in flying time was a record set by the U.S. Army Air Transport Command in a New York-to-Paris non-stop trans-Atlantic flight in August 1945. The 3,600-m. passage was made in 14 hours, 12 minutes.

Most of the substantial exploits and achievements in aviation, including the construction of some of the world's biggest aircraft, are credited to America, birthplace of heavier-than-air flight.

Aviation manufacture and research have constituted no small part of aviation development in recent decades. Research on aeronautical problems has been carried on by private manufacturing companies, educational institutions, and the National Advisory Committee for Aeronautics. One of the most important developments in recent years has been the introduction of the "laminar flow" wing. The smooth, laminar flow of air across the top of a wing creates lift; when the flow becomes turbulent, the air not only fails to lift an aircraft but actually retards its flight by increasing what aerodynamicists know as "drag," *i.e.,* air resistance. Shortly before World War II a means was found of extending the laminar flow. These findings were incorporated in the construction of the U.S. Army's P-51 Mustang fighter plane and the B-24 Liberator bomber. Since then, additional work has been done on the problem, both by sucking turbulent air off the wing into the interior and by introducing compressed jets of air onto the wing's surface.

NUCLEAR POWER FOR BOMBERS?

This Convair NB-36H was the first to carry an operating atomic reactor. Extensive tests were expected to yield information on the problems to be solved before nuclear-powered planes could be built on a large scale (*Official U.S. Air Force Photo*)

From a half-dozen aircraft plants which survived the termination of wartime contracts in 1918, the aircraft manufacturing industry during World War II grew into a business employing more persons than any other industry in the U.S. In 1957 one person in every 20 engaged in manufacturing in the U.S. was employed in making aircraft, component parts, or missiles. Most of the 878,000 workers on company payrolls were engaged in turning out military aircraft or missiles.

FLYING CONTESTS, RECORDS, AND FAMOUS FLYERS

During the pioneer and later years of airplane development, competitions to test and reward endurance, distance, speed, and new improvements were an important factor; to set records, there had to be constantly improved planes; and to pilot these planes in daring feats there had to be highly skilled flyers. Thus, airplane races, although abandoned during World Wars I and II, have a definite place in the advancement of aviation.

In the *Schneider Cup Races* speed records were rapidly advanced from 46 m.p.h. in 1913 to 340.08 m.p.h. in 1931, when the trophy was retired. Other important air contests were the *Guggenheim Safe Aircraft Competition,* the *Ford National Reliability Tour,* and the *All American Air Derby,* in addition to the national air races, which included contests for the *Bendix Trophy, Thompson Trophy, Women's Trophy, Sohio Trophy,* and numerous others.

The official world air records as established by the *Fédération Aéronautique Internationale* are:

Altitude—101,516 ft.; 1957; Winner: Maj. David G. Simons, USAF; U.S.

Distance in a Straight Line—11,235.600 m.; 1946; Winners: Comdr. Thomas D. Davies, Comdr. Eugene P. Rankin, Comdr. Walter S. Reid, Lt. Comdr. Ray A. Tabeling, USN; U.S.

Distance, Closed Circuit—8,854.308 m.; 1947; Winners: Lt. Col. O. F. Lassiter, pilot; Capt. W. J. Valentine, co-pilot; and crew, USAF; U.S.

Maximum Speed over a Straightaway Course at Unrestricted Altitude—1,404.19 m.p.h.; 1958; Capt. Walter W. Irwin, USAF, subject to homologation by the National Aeronautic Assn. and the FAI.

Official world "class" records, for jet-propelled aircraft, include:

Maximum Speed Over a Measured Straightaway Course (3 km.)—752.943 m.p.h.; 1953; Winner: Lt. Comdr. James B. Verdin, U.S. (in jet-engine powered delta-wing monoplane).

Maximum Speed Over a Measured Straightaway Course (15-25 km.)—1,132.136 m.p.h.; 1956; Winner: L. P. Twiss, D.S.C., Great Britain (in Fairey Delta II, Rolls-Royce Avon jet engine with afterburner).

Some of the world's famous flyers

Wright Brothers (Orville and Wilbur) of the U.S.: first flight in a heavier-than-air, motor-driven plane, at Kitty Hawk, N.C. (1903).

Alberto Santos Dumont of France: first officially recorded airplane flight in Europe (1906).

Louis Blériot of France: flew the English Channel from Baraques to Dover, 32 m. (1909).

Glenn H. Curtiss of the U.S.: first successful water landing (1910).

M. P. Prier of France: first non-stop flight from London to Paris, in 3 hr., 56 min. (1911).

Capt. E. F. White of the U.S.: non-stop flight from Chicago to New York, 727 m. (1919).

Lt. Comdr. A. C. Read of the U.S.: first trans-Atlantic flight from Newfoundland to Portugal by way of the Azores (May 16 to 31, 1919).

John Alcock and *A. W. Brown* of England: first non-stop flight across the Atlantic Ocean from St. John's, Newfoundland, to Clifton, Ireland, in approximately 16 hours (1919).

Hugo Eckener of Germany: commander of the German dirigible *ZR-3* in a non-stop flight from Friedrichshafen, Germany, to Lakehurst, N.J., in 81 hr., 17 min. (1924). Later, with *Graf Zeppelin,* first commercial trans-Atlantic flight, with 20 passengers (1928).

Richard E. Byrd of the U.S.: with *Floyd Bennett* as pilot, flight from Kings Bay (Spitzbergen) to the North Pole and return in about 15 hours (1926). Byrd also flew over the South Pole (1929).

Col. Charles A. Lindbergh of the U.S.: first solo non-stop flight from U.S. to Europe (New York to Paris), in 33½ hours (1927).

Amelia Earhart of the U.S.: first woman to fly across the Atlantic Ocean, pilots *W. Stultz* and *L. Gordon,* from Newfoundland to Wales (1928). She later set many records.

Capt. Hermann Koehl and *Baron von Huenefeld* of Germany: with *Comdr. James E. Fitzmaurice* of Ireland, manned the *Bremen,* the first monoplane to cross the Atlantic westward (1928).

James A. Doolittle of the U.S.: first demonstrated "blind flying" (1929) and later set many records.

Wiley Post of the U.S. and *Harold Gatty* of Australia: round-the-world flight in 8 days, 15 hr., 51 min. (1931).

Howard Hughes of the U.S.: set world landplane record of 352.388 m.p.h. (1935) and a new west-east record of 9 hr., 26 min. from Burbank, Calif., to Newark, N.J. (1936), only to beat it in 1937 with 7 hr., 28 min. In 1938, with four companions, he circled the globe in 3 days, 19 hr., 8 min.

M. Gromov, A. Yumachev, and *S. Danilin* of the U.S.S.R.: non-stop record of 6,296 m. from Moscow, Soviet Union, over the North Pole to San Jacinto, Calif. (1937).

Attileo Biseo, Magg. Amedeo Paradisi, S. Ten. Giovanni, and *Vitalini Sacconi* of Italy: flew from Rome, Italy, to Rio de Janeiro, Brazil, in 41 hr., 32 min. (1938).

Capt. D. C. T. Bennett and *First Officer I. Harvey* of Great Britain: established a new record for Class C-2 seaplanes by flying 5,997 m. from Dundee, Scotland, to Fort-Nolloth, South Africa (1938).

Col. Nicola di Mauro of Italy: attained a world class record for Class C-2 seaplanes by ascending 44,429 ft. (1939).

F. Bourlouzki and *A. Aliochine* of the U.S.S.R.: achieved a new world class record for balloons by flying from Moscow to Charaboulski in 61 hr., 30 min. (1939).

Fritz Wendel of Germany: established a new world record speed of 469.2 m.p.h. (1939).

Comdrs. T. D. Davies, E. P. Rankin, and *W. S. Reid,* and *Lt. Comdr. R. A. Tabeling,* all USN: flew non-stop 11,235 m. from Perth, Australia, to Columbus, Ohio, in a twin-engine plane (1946).

Jacqueline Cochran of the U.S.: flew 469.5 m.p.h. to a new Class C record in an F-51 fighter plane (1947).

Col. William H. Council of the U.S.: new west-east transcontinental record time from Burbank, Calif., to New York in 4 hr., 13 min., 26 sec. (1946).

Paul Mantz of the U.S.: set new east-west record of 6 hr., 7 min., 5 sec. from New York to Burbank, Calif. (1947).

William P. Odom of the U.S.: set new unofficial round-the-world record, 19,645 m. in a total time of 73 hr., 5 min., 11 sec. (1947).

Capt. James Gallagher of the U.S., and a 13-man crew: first non-stop flight around the world. The B-50 Superfortress, which took off on the 23,452-m. flight from Ft. Worth, Texas, returned to the same base in 94 hr., 1 min.; refueled four times en route by B-29s (1949).

William S. Ivans of the U.S.: flew a sailplane to an altitude of 42,100 ft. for a new world record (1950).

Richard H. Johnson of the U.S.: established a new single-place Class D sailplane record with a distance of 535.1 m. (1951).

E. J. Smith of the U.S.: established a 1,217-m. non-stop distance record for helicopters without payload, Ft. Worth, Tex., to Niagara Falls, N.Y. (1952).

Audouin Dollfus of France: flew a balloon 129.6 m. for a new distance record in the 250-cubic-meter class (1953).

M. J. Lithgow of Great Britain: flew from London to Paris in 19 min., 5.6 sec., at a speed of 669.4 m.p.h. (1953).

Col. Willard W. Millikan of the U.S.: set jet speed record from Los Angeles, Calif., to New York in 4 hr., 8 min., 5 sec. (1954).

Frantisek Novak of Czechoslovakia: flew a light airplane 2,561 m. in a closed circuit for a new class record (1957).

Gen. Curtis E. LeMay, USAF, with a crew and eight passengers: flew a jet transport from Buenos Aires, Argentina, to Washington, D.C., in 11 hr., 3 min., 57 sec. at an average speed of 471.4 m.p.h. (1957).

Functionally, aviation falls into three classifications—military flying, private and business flying, and common carrier operations.

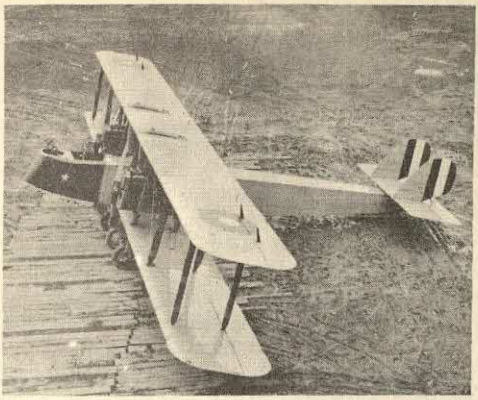
MILITARY AVIATION

Military aviation commenced late in the 18th century when the French army organized history's first balloon corps. Aviation made its first notable contribution to warfare, however, when both the Federal Union and the Confederate States employed tethered and free balloons for reconnaissance and artillery observation. Although the first bombproof shelters, as such, were constructed in large numbers in heavily populated areas during World War II, similar shelters actually were in use almost fourscore years before during the Civil War.

Military flying came into its own during the last half of World War I (1914-18). Tethered and powered balloons, the latter propelled by engines, were employed as they were in the

COMPLETE RECORD NON-STOP FLIGHT, JAN. 18, 1957

One of three eight-jet subsonic B-52 bombers which completed a record flight around the world is shown below. The flight, which featured in-the-air refueling, covered 24,325 m., at an average speed of 525 m.p.h. The trip took 45 hr., 19 min. The U.S. Air Force thus demonstrated its ability to fly, if necessary, to any point of the globe, deliver nuclear bombs, and return to the U.S. without landing (*Wide World Photos*)



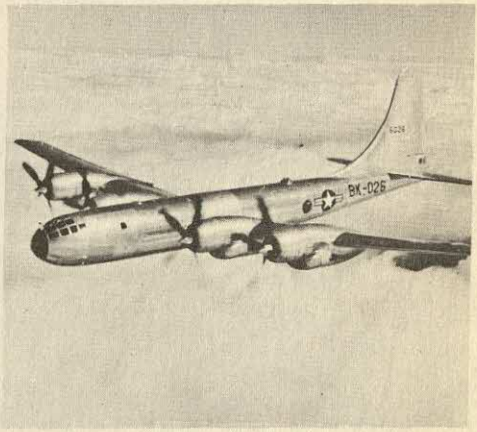
MARTIN BOMBER, 1919

The modern streamlined, heavily gunned bombers are all monoplanes; most of the warplanes produced during World War I were biplanes (*courtesy Aviation Magazine, N.Y.*)

American Civil War and their use was greatly expanded, but the airplane became the chief instrument for offensive and defensive operations in the air. Three distinct types of heavier-than-air craft evolved from the military needs of this conflict: reconnaissance, or scouting, planes; bombardment planes; and *chasse* planes, also known as pursuits and fighters. Contrary to accepted belief, the greatest raids staged by Germany on England during this period were made by airplanes, not by the famous Zeppelin balloons. The first four-engine bombing aircraft were constructed by Imperial Russia (I. I. Sikorsky, *q.v.*) for employment against German military objectives. The technique of strafing troops with machine-gun fire from the air was developed. The art of military photographic reconnaissance by air received great impetus. Air combat between fighter aircraft became an accepted element of warfare. While bombardment aircraft speeds remained, for the most part, below 100 m.p.h., the speeds of fighter aircraft had risen by the close of the conflict from some 70 m.p.h. at the start of the war (when incipient fighter types were used for scouting only) to about 150 m.p.h.

Steady peacetime development of military aircraft occurred in the 21-year period between the two great wars. Japan's air attacks on China, Italy's war against Ethiopia, and the Spanish Civil War (Guernica, bombed by the German air force in June 1937, was the first European town to be razed by air warfare) during the decade beginning in 1930 served as proving grounds for the theories of air warfare.

With the start of the century's second great war in 1939 came the fulfillment of aviation's role in armed conflicts among peoples. As compared with the three primary functions of military aircraft in the first of the century's great wars, many other functions rapidly developed. "Pathfinder" planes were employed to light up targets with incendiary bombs, blazing an air trail for the heavy bombers, bearing demolition explosives, that followed. "Intruder" aircraft made lightning night raids on the enemy's airfields to harass his air operations and destroy his striking power. Large-scale air assaults against surface vessels began with an unannounced and surprise attack (formal declaration of war came afterward) by the Japanese on the U.S. naval base at Pearl Harbor, Hawaii. The Germans introduced the intensive dive-bombing technique that leveled Rotterdam (May 1940) and the English city of



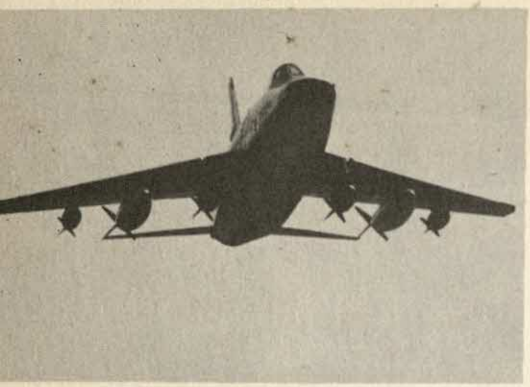
BOEING B-50 SUPERFORTRESS

A long-range bomber, similar in appearance to the famed B-29 which carried air warfare into the heart of Japan, the B-50 was put into the air in 1947. Faster than the B-29, it was classed as an even more difficult target for defensive gunners

SUPERSONIC BOMBER

This Convair Hustler, a delta-wing bomber powered by four jet engines, can fly faster than the speed of sound and can carry nuclear weapons

Coventry (November 1940). Torpedo bombing became a commonplace. Aircraft laid mines in enemy waters, thus usurping a traditional function of surface vessels and submarines. Great Britain, and later the U.S., adopted a policy of "saturating" a target with thousands of tons of high explosives carried by thousands of big airplanes employed in a single attack. Gliders were employed in offensive operation to deliver troops at critical points of combat. Military transports delivered troops by parachute. Heavy bombers were thrown into the direct support of ground operations, such as that on the Anzio beachhead in Italy, a large flanking movement on Rome

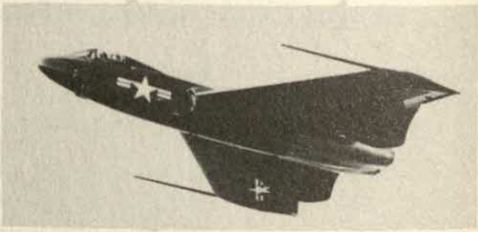


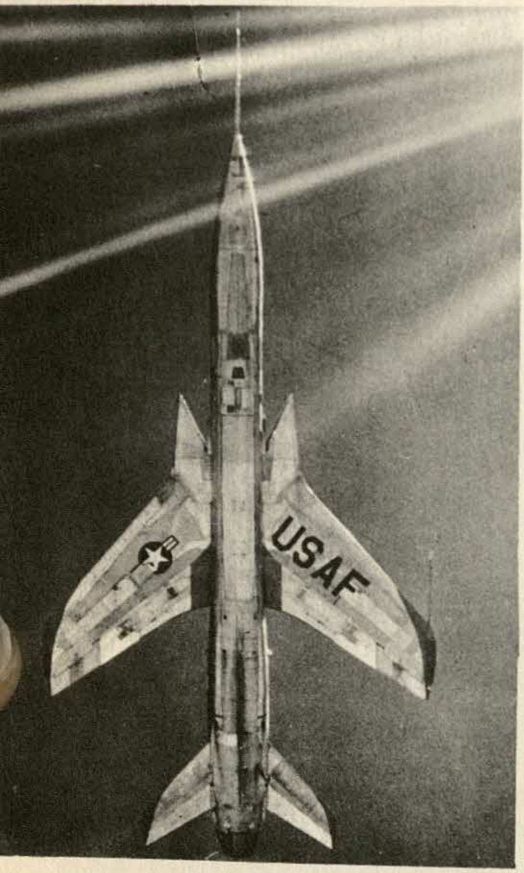
NORTH AMERICAN F-100C SUPER SABRE
(*top*)

The sweptback fighter set the first official world's speed record for a turbine-powered jet plane flying faster than the speed of sound. On Aug. 20, 1955, the F-100C set a record of 822.135 m.p.h. The supersonic fighter, shown with bombs and fuel tanks suspended from the wings, is capable of carrying nuclear weapons

CHANCE VOUGHT XF7U-1 CUTLASS
(*below*)

A twin-jet fighter with sweptback wings, this radically designed plane is intended for shipboard operation





SUPERSONIC FIGHTER PLANES

Airplane shapes have undergone drastic revisions since the advent of jet propulsion. Graceful and pleasing configurations have given way to stub wings and pencillike fuselages. The Republic Thunderchief (*left*) is described as the world's most powerful fighter-bomber. The Lockheed Starfighter (*below*) carries missiles on its wingtips

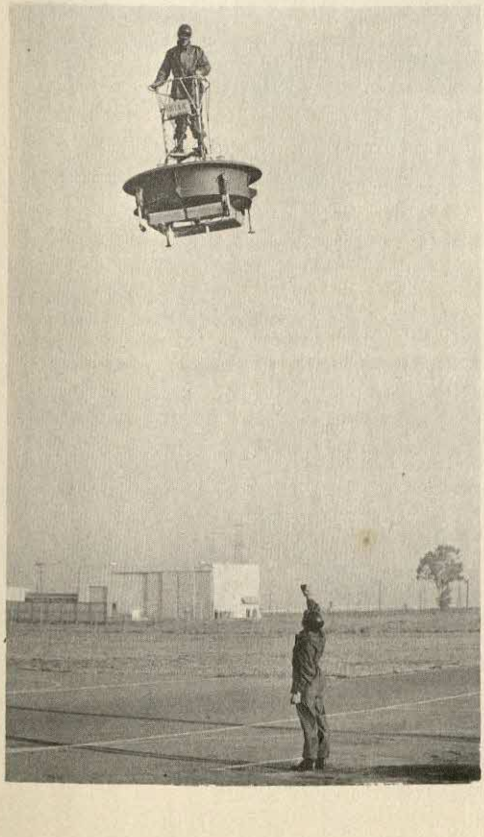
that followed the first invasion of the European continent (February 1943) by forces of the Allies. Fighter aircraft and light bombers were used on low-level attack missions intended to confuse the enemy defense. Most significant was the employment of aircraft as long-range mobile artillery in land warfare and amphibious warfare. The aircraft carrier (*q.v.*), a speedy vessel with a capacious interior and a flat top that was used as a landing and take-off field, became the most important unit of any navy. Bombardment aircraft, the backbone of air offensive operations as fighter aircraft were the backbone of defensive operations, became highly specialized. They ranged from small, short-range bombers to wide-winged heavy bombers capable of carrying from eight to ten tons of explosives on missions of many hundreds of miles.

Between the close of World War II and the start of the Korean War in 1950, the jet-propelled airplane, particularly in fighter versions, came into its own. All land-based fighter and fighter-bomber missions were conducted by jets. Except for naval carrier operations, the propeller-driven airplane was in eclipse as a combat aircraft, and in the years that immediately followed, even naval combat flying was converted to jet propulsion. Speeds hitherto unknown, approaching that of sound in level flight and exceeding it in dives, were achieved. In aeronautical research, the door was being opened to speeds of 25 m., and more, a minute.

In the experimental field military aircraft were beginning to assume odd postures and designs. To increase their dexterity and to obviate the need for landing fields in wartime, military services developed VTOL (Vertical Take-off and Landing) aircraft. One type, originated by the Ryan Aeronautical Co., literally stood on a column of jet gases in latching itself to and disengaging from a vertical landing platform, much as a housewife pins a garment to a clothesline. Other types pointed their propellers upward for take-off and landing, and swiveled them forward 90 degrees for forward flight. Still others combined rotor systems with fixed wings. Flying platforms lifted by upward-pointed propellers and given horizontal propulsion and direction by shifting the weight of the body were built as experimental personal vehicles for infantrymen. So were personal helicopters that were strapped to the soldier's body. See also *Air Force; Air Warfare.*

INDIVIDUAL FLYING PLATFORM

This experimental "ducted-fan" aircraft rises because a propeller enclosed within its base (and therefore ducted) acts in principle like a helicopter rotor. The pilot travels horizontally by leaning in the direction he wants to go (*courtesy Hiller Helicopters, Palo Alto, Calif.*)



PRIVATE AND BUSINESS FLYING

Before the start of World War II, private aviation reached new heights of achievement in the U.S. While the number of certificated aircraft and pilots was small in relation to the nation's total population, the U.S. outran any other nation in this type of flying. It had, in 1941, approximately 100,000 licensed pilots and 25,000 certificated aircraft.

In the beginning all flying lay within the category of private flying. That is, American aviation was in the primitive stage of its development, and the only persons directly interested in it were engineers, inventors, and sportsmen. Until the late 1920's, the private airplane for a consumer market did not exist. At that time, a few manufacturers began the fabrication of small aircraft (capable of carrying from two to five persons) at a cost that was not considered prohibitive. But private aircraft, as such, were owned by only a few hundred persons. In the 1930's, particularly when liberal government support became available for introducing college students to aviation, private flying experienced a meteoric growth. A half-dozen manufacturers of consumer-type aircraft supplied the market. Fully loaded, such aircraft weighed from 1,000 to 2,000 pounds, flew

PERSONAL AIRPLANES DE LUXE

Personal aircraft have come a long way in design and performance since the days of linen wings and wire bracing. The Piper Aztec B (*above*) accommodates six passengers and cruises at 200 m.p.h. The interior of the five-passenger Cessna (*right*), elaborately styled and expensively trimmed, is private luxury aloft

at 70 to 150 m.p.h., could be operated at an overall cost of 12 to 35 cents a mile, and obtained from 10 to 30 m. from a gallon of fuel.

Several factors retarded the growth of private flying, as compared with the widespread use of the automobile. The first was cost in relation to utility. The initial investment in an airplane and the cost of its upkeep were greater than those for an automobile, yet the airplane had far less personal utility than an automobile. Its chief advantage lay in swift, long-distance operations, whereas the average person demanded a conveyance for short-distance travel. Another factor retarding the growth of private flying was a system of intimate government supervision. This ranged from mandatory periodic inspections of aircraft, engines, and radio equipment to periodic physical examinations for license holders. Under the leadership of technicians in government agencies, moves were initiated to relax the regulations governing private flying so that a greater proportion of the population might be induced to take to the air. Corollary to the airplane's lack of utility was a lack of landing facilities, a fault that was rapidly mended by an extensive airfield construction program inaugurated after Pearl Harbor. A second corollary was a lack of inexpensive navigation facilities. While the commercial airlines commanded the use of an elaborate system of radio aids for navigation at night or in unfavorable weather conditions, the average private flier was accustomed to winging from one point to another only by visual aids—by following ground installations and physical features as they appeared on the map. Better navigation and landing facilities for the private flier gave promise of accelerating the use of personal planes.

The postwar market developed quickly with a comparatively strong demand for two-place aircraft of the training type. At the same time a relatively new area of private flying came into being. That was business flying. Businessmen bought surplus war transports—in some instances even attack bombers—and refurbished them as personal or company transports. By 1957, 20,000 airplanes, both single- and multi-engine, were being used for business purposes. Business airplanes were used for cargo haulage, in agriculture, as air taxis, for special charters, for geophysical research, and for survey and patrol work. Privately flown and business aircraft were flying at a rate of 10,000,000 hours annually, or three times more hours than were being flown by the nation's commercial carriers. Aids to navigation and lightweight automatic pilots were pacing the growth of non-scheduled as well as scheduled flying. There were 65,000 m. of controlled airways. Omni-directional radio ranges, immune to static, supplied pilots with ready navigational information, and the use of radar air traffic control at terminals was being rapidly increased.

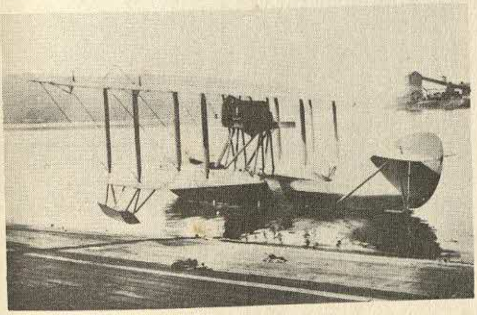
Gradually being introduced into private and business flying—now earning the name of "general aviation"—was a new propulsion combination of the gas turbine and the propeller. It substituted for the piston, or reciprocating, engine the same type of power plant as that used in jet-reaction flight. It produced much less vibration than the piston engine. Instead of producing airplane velocity by jet, it was geared to conventional propellers. In business transports turbine-propeller propulsion, although capable of speeds only 100 m.p.h. short of those in pure jet transports, was more economical of fuel.

By far the world's most airborne nation, the U.S. had a civil air fleet of 66,000 aircraft, only 1,800 of which were in common carrier operations. Certificated pilots, including those with transport, commercial, and private ratings, numbered 650,000.

COMMON CARRIER OPERATIONS

Except for the more newsworthy phases of military aviation, commercial aviation has been most stimulating to the popular imagination since 1927.

Although the actual beginnings of commercial air transport dated from before World War I, when rigid-type lighter-than-air craft (airships) were operated commercially in Germany (see *Balloon*), licensed air transport operations postdated that war. The first common carrier flights in heavier-than-air craft started between England and the continent of Europe. Some historians credit the Dutch with inaugurating the first service between London and Amsterdam in 1919; others report that the first services were commenced between London and Paris in the same year. Refurbished bombing planes were employed. In the ensuing decade Europe became a network of airlines. Big companies, most of them financially subsidized by their respective governments, grew up, notably Deutsche Lufthansa for Germany, Air France for France, Koninklijke Luchtvaart Maatschappij Voor Nederland en Kolonien N. V. (KLM) for The Netherlands, Imperial Airways for Great Britain, and Ala Littoria for Italy.



EARLY FLYING BOAT

Constructed in 1919, this wood-frame ship was used to ferry mails between Seattle and Victoria, B.C., in the first commercial airmail service in the U.S. (*courtesy Boeing Aircraft Co., Wash.*)

In the U.S. common carrier operations were slower in developing. They grew out of sporadic attempts to carry the mails. The Army began mail transport by air in the spring of 1918 but demands of the war led to postponement of regular service after a few weeks of trial (see *Air Mail*). By midsummer of that year, however, some aircraft, especially refurbished for mail work—the first such event in the history of aviation—were delivered to the Post Office Dept., which, in the meantime, had taken over the idea from the Army, and scheduled flying with mail pouches was begun between Washington and New York. The cost of sending a letter by mail was 24 cents an ounce. Service was begun between Cleveland and Chicago in the late spring of 1919, and, that summer, between Cleveland and New York. Transcontinental airmail service started in September 1920. Most of the aircraft employed in such flying were converted Army observation planes. Until the year 1927, the Post Office Dept. continued to be the only scheduled-flight aircraft operator in the U.S., except perhaps for scattered short-haul taxi services. At that time it turned over the carrying of mail to private airlines that were organized simultaneously for that purpose.

Operationally the airlines were shaky. Although several thousand miles of so-called "lighted" airways (*q.v.*), marked by strings of electric beacons on the ground, had been established by the government, as transport types the aircraft were rudimentary. Engines were not highly reliable; pilots were not highly trained. Transport service for the public was a touch-and-go operation. Among the most famous aircraft of the time was the Boeing 40-B, essentially a mail carrier but fitted to accommodate four passengers in cramped quarters.

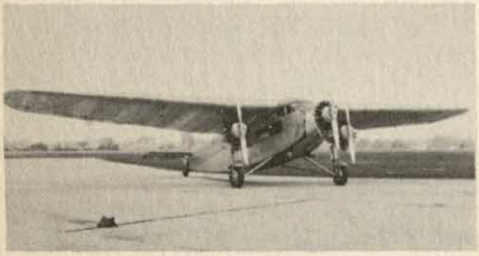
Successively the airlines operating domestically tried out tri-motored Fokker aircraft, designed by a Dutch engineer who had built military airplanes for the Germans during World War I; the tri-motored Ford, the first American-made all-metal transport aircraft, built by the automotive manufacturer, Henry Ford; tri-motored Stinson transports; tri-motored Boeing 80, employed between Chicago and San Francisco; twin-motored Curtiss Condor; twin-motored Boeing 247; Douglas DC-2, and finally the Douglas DC-3. It was 1936 before the 21-passenger DC-3 was introduced in common-carrier operations. It was standard equipment on most U.S. airlines as well as on other airlines throughout the world for about a decade. It was large for the period, aerodynamically stable and, properly serviced at termini, exceptionally dependable. In 1940, the first of the four-engine transports to go into scheduled service was introduced by the Boeing Aircraft Co. of Seattle. Known as Stratoliners,

FOKKER F-32

An early but notably unsuccessful airliner type, with four engines mounted in tandem, this plane was produced by the fabulous World War I manufacturer, Anthony Fokker, and flown around on exhibition tours late in 1920. It was never put in service (*courtesy Aero Digest, N.Y.*)

they seated 33 persons and cruised at 200 m.p.h. (20 m.p.h. faster than the DC-3); able to fly at an altitude of 20,000 ft., the plane had a "pressurized" cabin which maintained comfortable atmospheric conditions.

Almost ready for use on the airlines at, or shortly after, the start of America's participation in World War II (December 1941) were two other four-engine types, the Douglas DC-4 and the Lockheed Constellation. The Lockheed Aircraft Co. of Burbank, Calif., created a sensation in airline circles when it announced that the Constellation was designed to cruise with a load of more than 50 passengers, baggage, and mail at 275 m.p.h.



FORD TRI-MOTOR TIN GOOSE

This early transport plane, carrying 10 to 12 persons, was standard equipment on many airlines for several years (*courtesy Aviation Week, N.Y.*)

American transport operations over salt water were only two years behind those on domestic lines. In 1929, Pan American Airways began an international airline between Key West, Fla., far down the Florida Keys, and Havana. In the beginning, a Fokker airplane was employed on this run, but rapidly, through consulting manufacturers of large aircraft of various designs, the airline adopted flying boats (see Aircraft Types, earlier in this account) as more nearly meeting the needs of over-water flying. Using the Caribbean as a laboratory for the more heroic operations, Pan American planned for the future, created a network of airways from Florida and Cuba to points in the Greater and Lesser Antilles, Mexico, and South America. By acquiring a predecessor company that had begun operations down the east coast of the South American continent and, from Buenos Aires, across the Andes to Santiago, Chile, Pan American gradually offered travelers American-flag air transportation to the most populous centers of Latin America. Then, through partnership with W. R. Grace & Co., steamship operators and financiers, Pan American completed the circuit of South America by instituting service between Santiago and the northernmost points in Colombia. Throughout this expansion period an aircraft type known as the Sikorsky S-42 did the bulk of the exploratory and transport work.

Armed with its operational knowledge to and in Latin America, the company in 1935 flung an airway for 9,000 m. across the Pacific, using the "island stepping stones" of Hawaii, Midway, Wake, and Guam as refueling points. From Manila the airway was extended to Macao, near Hongkong. In 1940, the same company began service to New Zealand by way of Hawaii.

The U.S., by virtue of its several years of ocean-flying experience, was ready to essay the Atlantic long before service actually was established. But other nations, to which U.S. airplanes were to fly, either were not yet ready to establish trans-Atlantic service, or America's diplomatic relations with them were not such as to encourage the development of airways. Not until 1939 were trans-Atlantic planes placed on regular schedule, though crossings of that ocean by air had become almost a commonplace. Simultaneously Imperial Airways (subsequently absorbed by a new government-sponsored company called British Overseas Airways) inaugurated service to the U.S.

DOUGLAS DC-7C

Two DC-7C commercial transports were used to initiate, in 1957, regularly scheduled 32-hr. trips, over the North Pole, from Copenhagen to Tokyo, by the Scandinavian Airlines System

By the close of 1958, the world's scheduled commercial air transport systems had grown to phenomenal proportions. In the U.S. and its territories, 45 certificated airlines, serving 706 cities, had surpassed the railroads for the second year in the number of passenger-miles (a passenger-mile is one passenger carried one mile) recorded annually—26,000,000,000 by air to 18,000,000,000 by rail, excepting rail commuters. Commercial air carriers not flying on regular schedule added another billion passenger-miles. This was a fourfold increase in 10 years. U.S. domestic air carriers had more than 76,000 seats available for passengers daily. They employed 145,000 persons and had established a safety record of one passenger fatality for each 1,000,000,000 passenger-miles flown. Airline flying was 30 times safer than it had been 20 years earlier. Against a standard cruising speed of 180 m.p.h. in 1942, piston airliners in 1958 were flying 360 m.p.h. and jets newly put into service were achieving 550 m.p.h., crossing the U.S. in less than five hours. As against maximum operational altitudes of 20,000 ft. for piston airplanes, the jets flew as high as 40,000 ft., or almost eight miles. As against 48,000,000 passengers transported in 1958, it was estimated that the airlines would be carrying 93,000,000 a year by 1965 and 118,000,000 by 1970. They were carrying more than 800,000,000 ton-miles of freight, express, and mail annually. In 1958 they had on order 475 pure jet and turbine-propeller transports, all to be in service by 1961.

The "feeder" airline system was expanding. This type of operation, serving the smaller communities and "feeding" the larger trunk services, began in 1946. In 1958 the 13 certificated feeders carried 4,200,000 revenue passengers in a fleet of 225 airliners.

In addition to the scheduled airline operations, there were 43 domestic air transport companies flying "non-sked," on contract for the carriage of passengers and freight. Operating 94 aircraft, they were designated "supplemental air carriers" by the U.S. Civil Aeronautics Board. With an enviable safety record, the supplemental carriers pioneered low-fare air-coach service, helped substantially in breaking the Russian-imposed Berlin Blockade in 1949, and supplied half the civilian transport capacity asked by the military services during the Korean War. They flew much of the equipment to the Far North for the establishment of America's DEW (Defense Early Warning) Line, and contributed to the airlift of Hungarian refugees during the 1956 revolution in that country.

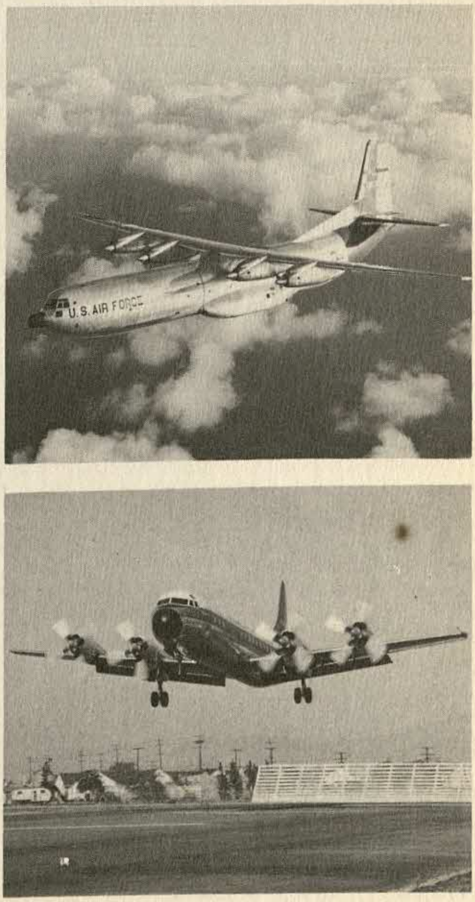
The world's first regularly scheduled helicopter mail service was inaugurated in Los Angeles, Calif., on Oct. 1, 1948. Furnishing a rapid shuttle service between outlying Los Angeles Municipal Airport and the roof of the downtown Post Office building, and serving more than 40 other communities on suburban routes, this helicopter service carried over 2,000,000 pounds of mail and made over 70,000 take-offs and landings in the first 15 months of service. This "all the way by air" service results in a time-saving of from 4½ to 19 hours on week-day mail, with even greater savings on week-end mail arrivals. By 1958 scheduled helicopter services had expanded to Chicago and New York, and these airlines were carrying some 232,000 passengers annually. Much of this progress was made possible by the intensive rotating-wing research necessitated by the Korean War, where the machines proved their worth many times over in rescuing military personnel caught behind enemy lines or downed at sea.

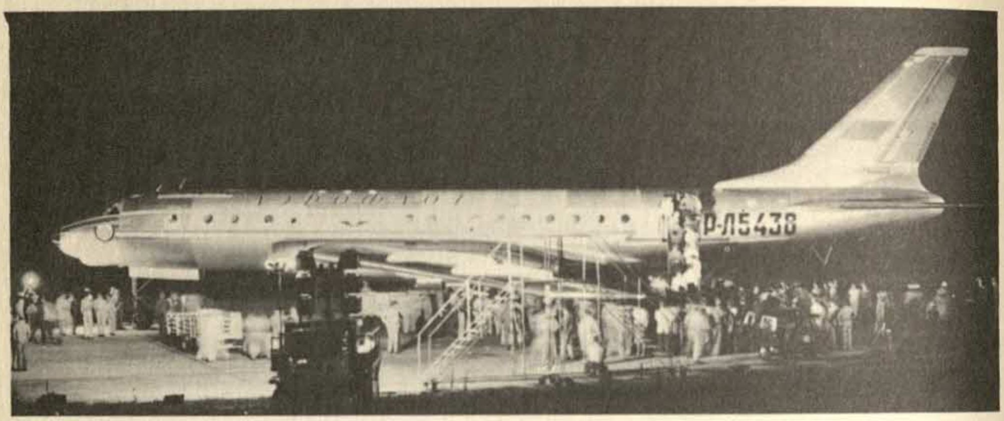
Only slightly less impressive than the growth of U.S. domestic airline traffic was that of the international services. In 1949 the world's fleets of international air transports carried 20,000,000 passengers. In 1958, 31 years after Lindbergh's flight from New York to Paris, they carried 89,000,000. Polar air routes, the shortest distances between many points on the globe (as between Scandinavia and the west coast of the U.S., for example), were growing in popularity. The major nations maintained permanent polar weather observation posts.

Implicit in the development of faster, bigger, more capacious airliners is the promise of increasing growth in domestic and international air

TURBOPROP TRANSPORT PLANES

The Douglas C-133 (*below*), a cargo and troop carrier, and the Lockheed Electra (*bottom*), a commercial airliner, are two of the newer transport-type aircraft that are driven by gas-turbine engines geared to propellers. Faster than piston-engine aircraft but slower than turbojets, these airplanes, called turboprops, are capable of speeds in excess of 400 m.p.h. The Electra shown here has its flaps, at the trailing edge of the wing, extended for added lift in landing





A SOVIET JET AIRLINER

The Soviets, too, have jet transports. A token of the striking progress of Russian technology, this twin-engine plane—the TU-104—was the first from the U.S.S.R. to be seen in the U.S. in 20 years when it landed in New Jersey in 1957 after a 22-hr. flight from Moscow, a distance of 5,300 m. (*United Press Photo*)

passenger traffic. The Lockheed L-1649A Starliner and the Douglas DC-7C, both U.S.-produced and the most sophisticated of the piston-propeller-driven transports, carry 60 to 100 passengers at 330 m.p.h. over non-stop distances of 6,000 to 7,000 m. By contrast, the new Boeing 707 and Douglas DC-8 jets carry up to 170 passengers at 550 m.p.h. over non-stop distances of 5,900 m. Smaller jet transports, with somewhat less capacity and non-stop ranges of 4,500 m., such as the French-produced Caravelle and the U.S. Convair 880, travel just as fast.

Of the turbine-propeller ("turboprop") aircraft being acquired by American domestic and many of the 76 international foreign lines, the larger, such as Britain's Bristol Britannia, have less speed but longer range. Russia's Tupolev TU-114 Rossiya is said to have a range of 7,500 m. Russia also produces jets ("turbojets"), *i.e.*, the TU-104 and TU-110 of medium range. Among the medium-range turboprops being sold to international services is the Friendship, built in the U.S. by Fairchild and in Holland by Fokker.

The higher speeds introduced by the jet transports compound a problem of shrinking air space for airplane maneuver that already was becoming critical in the mid-1950's in the U.S. Whereas a propeller airplane can "hold" above a congested airport in a "two-minute track pattern" measuring 3 m. by 8 m., a jet must describe a track pattern measuring 7 m. by 18 m. On the intercity airways the "closing rate" between two of the fastest propeller aircraft approaching each other head on is 968 ft. per second. The closing rate between two jet transports is 1,613 ft. per second. The airman's standard operating procedure under VFR (Visual Flight Rules) is to "see and be seen." Today's aircraft speeds frustrate his senses. If he drifts onto a collision course, he sometimes cannot comprehend his danger and act fast enough to avoid it.

Instrument flight aids, including surveillance radar, have been unable to cope with the problem of midair collision. An Airways Modernization Program is in progress. Accelerated in 1958 under a storm of indignant protests by the commercial airlines and their pilots against archaic air traffic controls employed by the Federal government, it nonetheless cannot be completed until 1963. When it comes into force, airplane maneuvers in any given segment of the U.S. air space will be regulated rigidly. Meantime, a stopgap measure was taken toward preventing collisions when all aircraft movements, both civil and military, were made subject to civilian control. In addition, airline companies propose to "make do" with such anticollision aids as heat-sensing instruments to warn a pilot of the proximity of another aircraft.

INTERNATIONAL AGREEMENTS

International air services began receiving an impetus as early as 1919 when air-minded nations began a study of laws governing aircraft manufacture standards, personnel qualifications, weather reporting, and communications procedures. The International Commission for Air Navigation (ICAN) was organized at Paris. Although great progress was made by ICAN in the two decades preceding World War II, only five airlines were operating with consistent safety when Holland's Royal Dutch Line marked its 20th anniversary. Pan American Airways carried the American flag across the Atlantic, Pacific, and Caribbean. Britain's Imperial Airways linked the United Kingdom with Canada, the British West Indies, the Asiatic colonies, and a handful of intermediate points in Europe and Africa. In other zones, Germany's Lufthansa and Air France Trans-Atlantique competed for patronage throughout Europe and South America and on the vital South Atlantic trade route. These five airlines, expanding piecemeal, building their own weather stations, establishing their own communications systems, determining their own standards for aircraft and crew safety, and determining their own charges for passenger and cargo accommodation, constituted the whole of "international aviation," beyond the regional services of Swissair and a few Scandinavian companies, when war came in 1939.

World War II relegated them to minor roles in a vast new network of world air routes mothered by the necessities of global war. The Dutch, German, and French operations were curtailed or entirely eliminated in the face of military air activity. Meanwhile, the American and British companies extended their services across the Atlantic and were joined by a half-dozen new airlines which previously had operated only in the U.S. or Canada. At the end of five war years, more than 30 countries were sponsoring international airlines and two dozen additional companies, lacking only in equipment, were determined to enter the world air picture. It was at this point that international aviation reached its second milestone—the International Conference on Civil Aviation.

In calling for a civil aviation conference at Chicago in November 1944, the U.S. Dept. of State recognized several immediate problems. Individual airlines could never provide all of the peacetime airports and navigational facilities demanded by world air commerce without vast, direct government subsidies. Moreover, 50-odd different countries could not be expected to make bilateral covenants which would permit unlimited free passage of civil aircraft in the world air space. Nor could any individual agreements prevent globe-circling aircraft from making emergency landings wherever the necessity might arise. When the Chicago conference adjourned after 40 days on Dec. 7, 1944, it had failed to a large extent in its original objectives. There were, however, so many accomplishments recorded by the 54 countries in attendance at Chicago that most leaders of aviation rate this wartime meeting as the "coming of age" for international civil aviation.

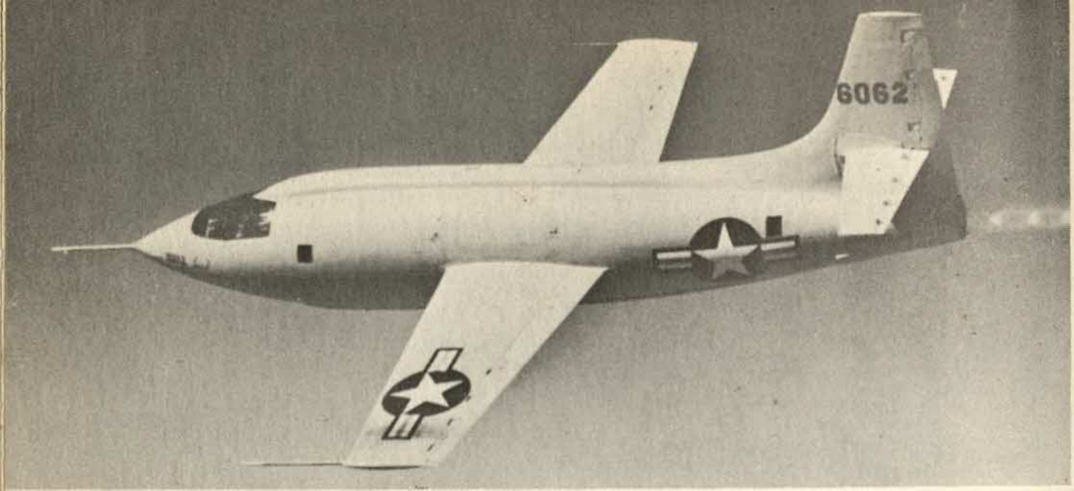
Foremost among the accomplishments was the establishment of the International Civil Aviation Organization. With 20 Interim Council delegates elected at large from the roster of 54 countries represented at the Chicago conference, ICAO convened at Montreal in August 1945—the day after Japanese capitulation brought an end to World War II. In less than six months, this first full-time international aviation body established weather reporting procedures and radiocommunications practices to standards acceptable throughout the world, determined temporary world standards for airworthiness (aircraft safety), developed a standard set of "rules of the air" for the entire world, won acceptance of the Chicago-born "two freedoms" agreement in more than 30 countries, fostered approval of the "third freedom" in more than 20 countries, and so firmly established a framework for all future discussions of international aviation problems that the "provisional" organization became permanent less than two years after adjournment of the meeting at Chicago. More important, ICAO so effectively dispelled major disagreements between airlines of participating countries that the airlines themselves organized a separate, nongovernmental body.

A Montreal neighbor of ICAO, this supplementary organization, known as the International Air Transport Association (IATA) and dedicated to settlement of all economic and operational differences, permitted ICAO to confine its regulatory jurisdiction to the technical aspects of world aviation. IATA came into being at Havana on April 12, 1945. At its heart are certain "freedoms" that had been written into bilateral agreements earlier as airlines coped with such controversial subjects as fares, frequency of schedules, and competitive routes.

The U.S.-British bilateral agreement, reached in an extended conference at Hamilton, Bermuda —the Bermuda Civil Aviation Conference—was drawn up in recognition of the rights of nations to their own air space. The air commerce agreement between the two countries, subsequently deposited with the Atlantic Traffic Conference of the International Air Transport Association, a trade group, provided that the IATA could fix air tariffs on the basis of operating costs. It also provided for a periodic review of such tariffs by the British and American governments. The number of scheduled flights would be unlimited. No prohibition was placed on the number of passengers which could be carried by any airline of any flag between international ports, although rights to "local" traffic in any one country were reserved to the flaglines of that country.

SUPERSONICS

It was long thought by aeronautical engineers that speeds beyond that of sound (760.5 m.p.h. in "standard air," *i.e.,* air at 59° F. at sea-level density) would depend largely on solving the problem of crossing the transsonic "barrier." In the years following World War II, these theories turned out to be unfounded. All that was needed was sufficient power and airplane configurations to accommodate the tremendous speed of the passage of air around them. In 1958 Capt. Walter W. Irwin, USAF, flying a Lockheed F-104A equipped with a General Electric J-79 turbojet engine, streaked to a new world record of 1,404.19 m.p.h. at Edwards Air Force Base, Calif.

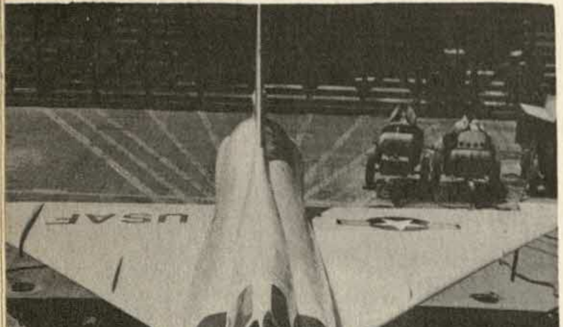


FIRST PLANE TO FLY FASTER THAN THE SPEED OF SOUND

In 1948 the Air Force announced that the Bell X-1 rocket-propelled experimental plane designed for a maximum speed of 1,700 m.p.h. had flown faster than the speed of sound (760.5 m.p.h.). A later version of the craft, the X-15, was flown at 3,920 m.p.h. in October 1961, setting a speed record for controlled aircraft

Earlier research, however, had had some mystifying results. During World War II, the Germans produced rocket-propelled winged aircraft that were fast enough to enter the transsonic area, but on three successive flights both the aircraft and their pilots were lost. This was due to certain phenomena attendant on high speeds, generally described as being between 640 and 840 m.p.h.

Flight at such speeds posed many questions. The most important was that of overcoming "compressibility," the tendency of the atmosphere to develop retarding shock waves around any shape driven through it at super-speeds. The shock waves robbed the shapes of their lifting properties, necessary to flight. Beyond that problem was the one of sheer drag, or resistance

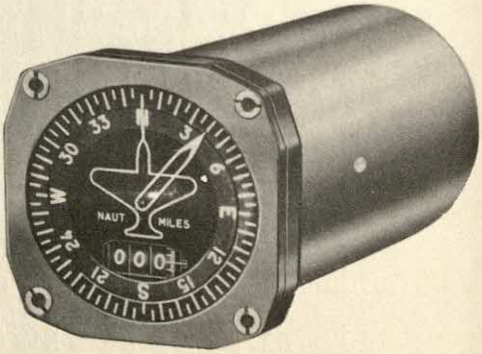


"COKE BOTTLE" FUSELAGE

An important advance in easing the way through the transsonic speed range and into the supersonic was the development of this narrow-waisted fuselage, here shown adapted to a fighter plane. The body narrows aft of the engine air intakes and flares out again at the tailpipe. This reduces the drag of air resistance that the plane encounters in fast flight (*courtesy Convair*)

AIR NAVIGATION AID

As airplane speeds grow ever faster, they demand increasing instrumentation. This deceptively simple-looking instrument, produced by the Ford Instrument Co., tells a pilot the direction and the number of nautical miles to his destination



of the air to any body passing through it. A second question was that of propulsion. The jet, producing thrust by means of gases under high velocity, was one possibility. Another was the rocket, producing thrust in the same way but carrying a fuel with a self-contained oxygen content. A third question was that of frictional heat developed by a body passing through the air. That question already had been answered in part by the U.S. Air Force in developing a refrigerating device for the cockpits of jet-propelled fighter aircraft. At 500 m.p.h. the temperature differential between cockpit and the outside air in such jet aircraft was 45° F., and at 600 m.p.h. it was 65°. In supersonic wind-tunnel (*q.v.*) experiments at the Ames Laboratory of the National Advisory Committee for Aeronautics, a Federal agency, it had been determined that the temperature differential at 1,500 m.p.h. would be in the order of 400°, and at 2,500 m.p.h. some 1,120°. It was known that German V-2 rocket missiles occasionally exploded prematurely during the war due to the frictional heat developed at speeds of 3,000 m.p.h. Therefore, in exploring the possibilities of supersonic speeds the question arose as to whether such speeds would be achieved with man-guided aircraft or with radio-guided missiles.

Initially at least, engineers had fixed upon the shapes that might be expected to achieve supersonic speeds. They experimented with radically swept-back wings and in some instances with radically swept-forward wings in an effort to delay the appearance of shock waves. Supersonic wings would have a sharp leading edge instead of the bulbous leading edge associated with conventional aircraft designed to fly by Bernoulli's law governing the action of fluids under velocity.

Research resolved all these questions. Today supersonic flight is a commonplace. There is hardly a hamlet that has not known the frightening "sonic boom" that attends passage of an aircraft through the sound "barrier." Manned, rocket-propelled aircraft are now projected to fly thousands of miles an hour.

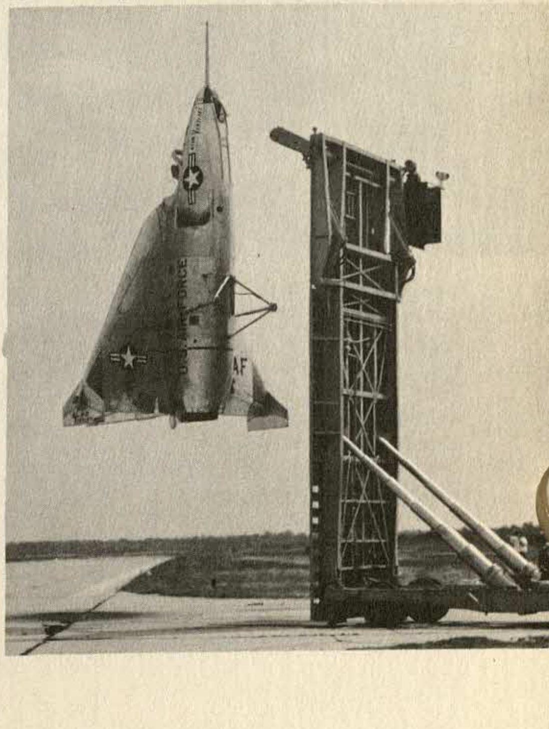
Jet and Rocket Propulsion

High on the list of wartime achievements of the British and U.S. air forces was development and adaptation to aircraft of jet-reaction engines. A common rotary lawn sprinkler is propelled by jet reaction. A bursting toy balloon flies off in one direction due to the jet reaction of the released air in the opposite direction. The principle of the jet is simple. If a metal globe is filled with compressed air or gas, the air or gas will exert equal pressure against each square inch of the interior of the globe. If, however, a hole is punched in the globe, the contained gas will stream out. The pressure exerted by the gas on the inside of the globe at the same instant will be concentrated at a point immediately opposite the hole. The globe will move at the point of pressure in reaction to the escape of the gas. That is how jet-powered aircraft are propelled.

Although the principle is simple, the jet-reaction device itself is somewhat complicated. Pressure must be built up to initiate and carry on the reaction. The heart of a jet engine is its turbine.

VERTICAL-RISING AIRCRAFT

The two airplanes shown below are flying standing still. Among the newest developments in military aircraft, they are known as VTOL (Vertical Take-off and Landing) planes. The Bell X-14 (below) flies standing still by deflecting the gases from two jet engines downward by means of vanes. The Ryan X-13 (*bottom*) literally sits on a column of hot gases when it detaches itself from and maneuvers to reattach itself to its vertical "landing field." Both planes operate conventionally in forward flight. The principle they employ, obviating the need for airports, may be adapted to nonmilitary uses

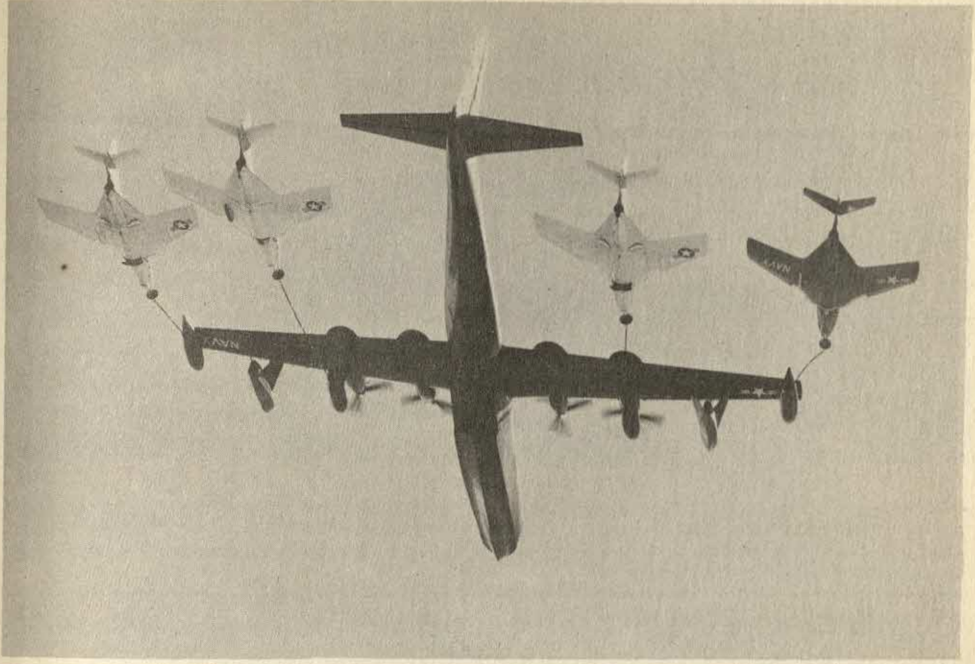


JET TRANSPORTS IN CIVILIAN USE

Recent entries in the world's commercial airline fleet include these two jet transports. The Douglas DC-9 (*above*), a twin-jet "compact" plane, has a range of up to 1,100 m. and takes off from runways half the length required by four-engine jets. Great Britain's De Havilland Trident (*left*) displayed its three-jet construction in this rear view of a trial take-off

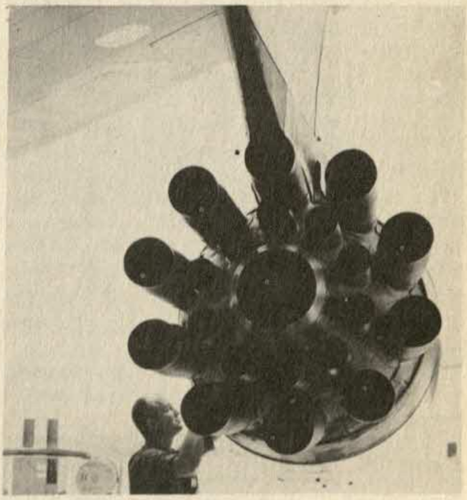
Through the turbine stream gases under high pressure. The turbine, whirling from 7,000 to 14,000 revolutions a minute, turns a shaft connected with a centrifugal compressor. The compressor is needed to compress the air to several atmospheres and thereby increase the volume of gases produced when fuel is burned. The greater the volume of gas, the greater the jet effect, or propulsive power. The course of the air through a gas turbine is entry through air scoops in the nose, sides, or wings of the aircraft, then through the compressor, then into the combustion chamber where it combines with burning gasoline, kerosene, or alcohol, then through the turbine, and finally through the tail pipe where its escape produces the jet reaction. As compared with the size of other portions of the engine, the tail orifice is narrow, to step up the velocity of the gas. Precisely the same reaction is obtained when rockets are employed on aircraft. The rocket, however, is a relatively simple mechanical device, essentially like the charge in a fireworks rocket. The rocket-propulsion device may consist of gunpowder, or some other highly concentrated explosive with its oxygen self-contained, or of liquid fuel and oxidizer, and a tail pipe through which the explosive's gases may be funneled. As between the gas turbine and the rocket, the former is a longer-lived propulsive force. With proper fueling the turbine can be run for hours. The rocket consumes its stored energy in a period of minutes.

By the spring of 1959, a new application had been given jet-producing engines. They were used to sustain vehicles in the air, not by jet reaction but by creating a cushion of air on which the vehicles rode. Such vehicles were beyond the experimental stage; at least one U.S. manufacturer was offering them for sale. The jetted air, supplied by horizontally mounted propellers, not only produced the cushion but, deflected to one side or another, by reaction also propelled the



FUELING AND SILENCING JETS

Four Navy jet fighters take on fuel from a Convair R3Y-2 Tradewind, a transport plane that carries enough fuel in its wing tanks for eight fighters (*above*). An experimental noise-suppressor is fitted to a Boeing 707 jet liner, in a move to overcome public objection to the strident roar of jet engines overhead and at airports (*right*)



vehicles. Without wheels, they were not land vehicles. Without wings, they were not airplanes. They were, in a fashion, "air sleds." Their maximum altitude was never more than a few feet.

Proponents of air sleds foresaw a spectacular future for them—ocean liners gliding above the waves at 150 m.p.h. and trains that would better airline schedules for distances of a few hundred miles, for the air sled can travel over land, marsh, or water. Besides the U.S., the British and the Swiss have also been experimenting with air sleds. The British are making plans for a huge air sled as a commercial ferry on the English Channel.

Aircraft jet propulsion by gas turbine, though it has produced speeds far beyond those achieved by reciprocating gasoline engine and propeller, has proved rather inefficient at speeds at which aircraft normally are flown. Fuel consumption is high. It is only at extremely high speeds that the gas turbine begins to achieve an advantage over the reciprocating engine-propeller combination in the rate of fuel consumption. Apart from its expensiveness, the gas turbine-jet propulsion principle has the added drawback of inflexibility in the thrust power produced. Jet thrust on the take-off of an aircraft builds up slowly. Large airports are necessary to the operation of jet airplanes. When a jet aircraft is throttled back in flight, some seconds are required to re-establish the thrust after the throttle is reopened. That peculiarity of jet engines has led now and then to accidents; emergency power was lacking when it was most needed.

The age of commercial jet transport flight is now upon us. In configuration, the airplanes are fatter and longer than their propeller-driven predecessors. The Boeing is wide enough for six seats across in tourist service. Wings are swept back to minimize drag. The Douglas weighs 143 tons at take-off compared with 12.5 tons for the DC-3, the first of the "big" transports in 1936,

SLEEK ENTRY IN THE JET STAKES

The Convair 880 jet transport, with a cruising speed of 615 m.p.h., is designed for operation from any airport now accommodating four-engine piston-powered transports. A product of General Dynamics Convair Division, San Diego, Calif., it is powered by four General Electric CJ-805-3 jet engines, the commercial version of the power plant used in the B-58 bomber

and requires 100 times as much electrical energy. A jet carries as much as 40 per cent of its weight in fuel compared with 30 per cent for a propeller aircraft. On a nonstop transcontinental flight a jet requires 16,000 gallons of fuel for consumption and for a safety margin at weather-plagued terminals where landing may be delayed. It consumes 2,000 gallons an hour. At take-off it requires hundreds of gallons of demineralized water for ingestion by the engines. This is not for cooling but, rather, to increase the "mass flow" of air and fuel and thereby restore some of the thrust lost to low initial speed. Winds, temperatures aloft, and altitude can cause differences of thousands of pounds in fuel consumption, but on a flight of 2,500 m. the maximum time difference is only 20 minutes.

The jet's controls are simpler. As compared with a dozen engine and propeller controls on the propeller-driven airplane, the jet has just one lever, which sends a signal to an automatic fuel-control device. Each jet engine develops ten times the thrust of the reciprocating engine currently used on big airliners. Cabin pressurization is greater than that in yesterday's transports. Pressure at 20,000 ft. is equivalent to that at sea level, and jets can descend without passenger discomfort at the extraordinary rate of four-fifths of a mile a minute.

Operationally, the jets pose problems for the airlines. Noise suppressors, at some cost to weight and thrust, had to be added to muffle the airplanes' roar and permit flight over congested areas. Reverse-thrust devices had to be designed to permit aerodynamic braking on landing. Protection had to be provided against the hazards of suction at jet-engine intakes, hot tailpipe exhausts, and the possible impairment of hearing in personnel forced to work around the noisy engines. Ramp areas, taxiways, and runways must be kept meticulously clean to forestall ingestion of debris by the engines, which are damaged easily by the introduction of foreign matter. Turn-arounds at termini must be fast because each minute an airplane is on the ground means lost money. Yet so fast is the jet that the number of airline airplanes still only on order in 1958 could supply nearly 15 times the annual airlift provided by all the commercial carriers during World War II.

Every major improvement in transportation has served as a vitalizing force to the economy everywhere. So it will be with mass jet aircraft transportation.

Glossary of Aeronautical Terms

Abort. Abandon a take-off or mission.

Absolute altimeter. An altimeter that registers height above the terrain, rather than above sea level.

Absolute altitude. Height of an aircraft over surface or terrain.

Absolute ceiling. Maximum altitude at which an aircraft can maintain level flight.

Acceleration. Process of velocity increase.

Acceleration error. Error in a bubble sextant or magnetic compass caused by mechanical inertia.

Accelerometer. An instrument that measures acceleration.

Acceptance rate. Rate at which aircraft can land.

Acoustic velocity. Velocity of sound waves, or similar waves, in a given medium.

Acquisition and tracking radar. A radar set that locks on to a signal and tracks the object emitting it.

Acrobatic. Pertaining to stunt flying.

Adiabatic lapse rate. Rate of temperature loss with altitude.

Adjustable pitch propeller. A propeller whose blade pitch can be changed manually.

Advancing blade. A helicopter blade as it moves from downwind to upwind position.

Aeroballistics. The ballistics of projectiles fired or dropped from an aircraft.

Aerocartograph. A stereoscopic machine used to prepare contoured maps.

Aerodynamic heating. Heating of an aircraft from air friction.

Aerodynamics. The art and science of flight.

Aeroembolism. An altitude decompression sickness.

Aeronautical charts. Specially prepared maps for visual piloting.

Aeroneurosis. A nervous disorder caused by too much flying.

Aerosphere. That part of the atmosphere in which flight is currently possible.

Aerostat. Balloons of any form, as distinct from heavier-than-air machines.

Afterburner. An auxiliary combustion chamber for jet engines.

Aftercooler. An air cooler between supercharger and intake manifold of a piston engine.

Aileron. Device for lateral control.

Airdrome. A landing field equipped to service, shelter and maintain aircraft; usually includes facilities for maintenance of personnel.

Airfoil. A structure designed to obtain a lift reaction from the air through velocity.

Airliner. A transport plane.

Air mass. Descriptive of large masses of air that, in movement, produce temperature and humidity changes that cause weather changes.

Air mile. A nautical mile by air.

Airplane. A flying apparatus with one or more planes or lifting surfaces.

Air plot. A means of determining an airplane's position.

Air position indicator. A flight instrument that continuously indicates the position of an aircraft in latitude and longitude.

Airscrew. Used as a generic term to describe a propeller.

Airship. The term is usually confined to dirigible balloons.

Air speed. A term used generally to describe movement of an aircraft with relation to "stalling" speed; the speed of any aircraft without relation to "ground speed" or actual m.p.h. movement over the ground.

Air speed indicator. A gauge showing air speed.

Air traffic rules. Rules fixed by the Federal government to govern the movement of aircraft.

Airway. A path or route designated as suitable for aircraft.

Altimeter. A gauge working on the weight-of-air principle to indicate height above sea level.

Ambient air. The surrounding air.

Amphibian (and Amphibion). An aircraft that can take off from and land on either land or water.

Angle, dihedral. In geometry, the angle between two planes. The wings of an airplane are said to be at a dihedral angle when they are upwardly or downwardly inclined to a horizontal transverse line. If the inclination is upward, the angle is positive; if downward, negative.

Angle, gliding. The angle between the horizontal and the path along which an airplane, in ordinary flying attitude, but not under engine power, descends.

Angle of attack. The attitude of a wing with relation to the ground.

Angle of bank. Degree of wing tilt from horizontal.

Anti-icer. A device designed to prevent the formation of ice.

Approach leg. That part of a landing pattern during which an airplane makes a final approach.

Apron. A hard-surfaced area used to park, load, unload or service aircraft.

Aromatic fuel. A fuel in which the chief chemical compound has a benzene ring structure.

Arresting wire. That part of the arresting gear, usually on a naval aircraft carrier, which engages a plane's arresting hook. Also called a cross-deck pendant.

Artificial horizon. A gyroscopic device to indicate a true horizon in the absence of visibility.

Aspect ratio. Length of wing with respect to chord.

Astronautics. The science of traveling through space or of sending vehicles, manned and unmanned, through space.

Atmosphere. The body of air which surrounds the earth.

Attitude. An airplane's or wing's position relative to the direction of motion through the air.

Autogiro. A flying machine deriving most of its lift from airfoils that rotate without engine power around a vertical axis.

Automatic pilot. A control mechanism incorporating a gyroscope which maintains a steady and preset course and altitude without assistance from a human pilot.

Avigation. The art of controlling the course of aircraft in flight.

Axial flow compressor. A compressor, especially in a jet engine, that forces the air in a straight line parallel to the axis of its rotating impeller.

Azimuth. Bearing in the horizontal plane, usually expressed as an angle, and in air navigation measured clockwise from true north, grid north, or magnetic north from zero to 360 degrees.

Bailout bottle. A portable metal bottle containing oxygen, used by persons after bailing out at high altitude.

Ballast. Any substance taken in a balloon to throw out for the purpose of lightening the load carried.

Ballonet. A word taken from the French meaning "little balloon"; an interior bag in a lighter-than-air ship used for control purposes.

Balloon. A contrivance that incorporates a nonporous bag filled with heated air or a gas lighter than air so that it rises and floats in the atmosphere.

Bearing. Direction of flight with relation to a true north compass reading.

Beaufort Scale. An arbitrary scale of wind velocities.

Bernoulli's Law. A principle governing the increased velocity of a fluid flow over a curved surface.

Binders. Brakes (*slang*).

Biplane. A flying machine with two main carrying surfaces, one over the other.

Bird cage. Area in jet planes where fuel, oil, and hydraulic lines connect to engine's accessory section (*slang*).

Blade. That part of a propeller arm or rotary wing that bites the air.

Blind approach. An approach for a landing under conditions of low ceiling or undercast and sometimes of limited visibility on the ground, usually made with the aid of instruments and radio.

Blind flying. Flying solely by the aid of instruments.

Block speed. The time taken by an airplane between a departure point and destination, measured from the moment of movement from the ramp until engines are shut off.

Blower. A supercharger geared to the crankshaft of an engine.

Booster bottle. A rocket used for a jet-assist take-off.

Bubble canopy. A cockpit canopy molded in one piece.

Buffeting. A knocking-about sustained by an aircraft surface in turbulence.

Butter paddle. A short, wide-bladed propeller (*slang*).

Calibrated air speed. The indicated air speed rectified to compensate for error in the air-speed indicator or pitot-static system.

Camber (of a wing section). The convexity of a wing section. The camber is usually measured as a fraction of the chord by the maximum height above the chord.

Carburetor. That part of an engine in which gasoline vapor becomes mixed with air in a proportion necessary for a burnable mixture.

Cargo parachute. A parachute used for dropping cargo from the air (exclusively military).

Catapult. A device for pushing an airplane or missile into the air from a ramp, rack or track; for ejecting a person from an airplane.

Caterpillar Club. An unofficial club for persons who have been required to bail out of a damaged or disabled aircraft.

Ceiling. The height above ground of the base of clouds; for aircraft, the height to which they can climb.

Celestial avigation. Air navigation by means of stars, moon, or sun.

Center of gravity. Mid-point longitudinally of an aircraft's weight.

Center of pressure. Mid-point of lift of an aircraft's wing.

Certification, aircraft. Licensing for flight, a function usually performed by the Federal government.

Chandelle. An exaggerated climbing turn.

Check flight. A flight on which a pilot or another crew member is checked for proficiency in the performance of duties.

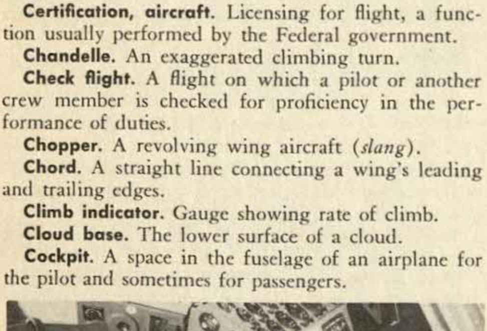
Chopper. A revolving wing aircraft (*slang*).

Chord. A straight line connecting a wing's leading and trailing edges.

Climb indicator. Gauge showing rate of climb.

Cloud base. The lower surface of a cloud.

Cockpit. A space in the fuselage of an airplane for the pilot and sometimes for passengers.



Cockpit

Cold front. Cold air mass that underruns warm air masses.

Collector ring. A hollow ring used to collect exhaust gases.

Combustion chamber. A chamber or cylinder in a rocket engine, jet engine or the like where the propellant is ignited.

Command pilot. The highest aeronautical rating in the U.S. Air Force.

Compass rose. A true-north compass on which aircraft compasses are "swung" after installation to determine their error.

Compressor. A device for delivering air under pressure to the combustion chambers of engines. They fall into two categories, those called positive displacement compressors, and centrifugal compressors.

Condensation trail. A visible trail of vapor, consisting of water droplets or ice crystals that sometimes form in an aircraft's wake.

Cone of silence. Area of no signal immediately above a radio range station.

Console. Pilot's cockpit control panels (*slang*).

Constant speed propeller. Propellers in which power settings automatically cause change of pitch.

Contact flight. Flight made with constant visual reference to the ground.

Controllable pitch propeller. A variable-pitch propeller so constructed that the pilot can change its blade angle in flight.

Control stick. A lever controlling pitch and roll.

Control tower. A facility at an airport for governing the movements of aircraft.

Convertiplane. An aircraft that can be adjusted to fly either as a fixed-wing airplane or as a helicopter or Autogiro.

Cowl flap. Shutters around air cooled engine cowlings to increase or decrease the amount of air for cooling.

Crab. Altering a compass heading to compensate for a cross-wind.

Cross-wind landing gear. A landing gear with castoring wheels that align themselves in the direction of the aircraft's motion regardless of the longitudinal axis of the aircraft itself.

Cruising radius. The distance that an aircraft with full tanks can cruise and return, allowing a fuel reserve for safety.

Dead reckoning. Avigation solely by compass compensated for by calculations for drift.

Dead stick landing. A landing without engine power.

Declination. The angular difference between magnetic north and true north.

Deviation. Errors in compass reading caused by magnetic forces within an aircraft.

Dew point. Air saturation with respect to temperature where precipitation occurs.

Dihedral. Angle of a wing taken from the wing root.

Direction finder. A device for taking a radio bearing.

Directional gyro. A gyroscopic device indicating a constant heading when set.

Directional stability. Ability of an aircraft to fly a straight line "hands off" with relation to the compass.

Dirigible. A balloon with a stiff internal structure and driven by one or more engines.

Dive. To descend steeply.

Downdraft. A down-flying current of air.

Drag. The resistance set up by air under velocity.

Drift. A lateral divergence from a projected heading due to side winds.

Drogue. A conelike piece of equipment used as a tow target.

Drone. A pilotless airplane controlled remotely by radio.

Dump valve. A device for permitting a pilot to jettison fuel.

Dutch roll. A combined yawing and rolling motion, often seen in swept-wing airplanes.

Earth inductor compass. A compass using a power-driven coil revolving in the earth's magnetic field as a sensing element.

Elevator. An airfoil set in a horizontal plane and hinged to a horizontal stabilizer for controlling the attitude of an aircraft on its lateral axis.

Empennage. Tail group of an aircraft.

Fairing. Any piece added to a structure to reduce its drag.

Fan marker beacon. A radio beacon transmitting a fan-shaped radiation pattern and located along an airway or near an airport.

Feathering. Turning the sharp edge of a propeller blade toward the direction of flight.

Fin. Upright tail surface used for directional stability.

Fishtailing. A maneuver in which the tail is swished to and fro.

Fix. A location of position, usually by radio.

Flameout. The loss of combustion in a jet engine.

Flaps. "High-lift" devices for landing and take-off.

Flare chute. A parachute attached to a flare to let it down slowly.

Flareout. Raising an airplane's nose just before the touchdown in landing.

Flat pitch. Low pitch.

Flight path deviation. The deviation of an aircraft from its planned course, usually expressed in degrees.

Flight plan. A plan of flight as to course and altitude filed with a Federal agency before take-off.

Flutter. A vibration of a wing or control surface.

Flying boat. An aircraft fitted with a hull for water operation.

Flying boom. A rigid hose through which fuel is delivered from a tanker to another aircraft.

Fuel-air ratio. The ratio of fuel to air in volume as supplied to the combustion chambers of an engine.

Fuselage. The body of an airplane.

G. The gravitational force or pull of the earth.

Gas turbine. A mechanical unit that spins in reaction to a current of gas passing through or over it; the prime mover of the turbojet and turboprop types of aircraft engines.

Glider. An aircraft that can fly without an engine, even though heavier-than-air.

Gore. A panel of a parachute.

Gradient wind. A wind that blows parallel to curved isobars in a field of unchanging pressure.

Granular ice. Ice formed when droplets freeze without completely breaking into a film of water.

Grayout. A temporary condition of hazy vision due to a lack of oxygen.

Great circle course. A course plotted along the shortest distance between two points on the surface of the earth.

GCA. Ground-controlled approach, an instrument approach for landing in response to radio directions from a controller observing the aircraft on a radar set.

Ground loop. An unusually sharp turn to right or left due to loss of directional control on the ground.

Ground speed. Actual rate of progress over the terrain as contrasted to air speed.

Gust. A sudden movement of air at a velocity greater than that in which an airplane has been flying.

Gyro horizon. An "artificial horizon."

Hammerhead stall. A maneuver involving a steep climb almost to the stalling point and a dropping of the nose in such manner that the plane reverses its flight direction.

Hardstand. A hard-surfaced area for parking an aircraft.

Heavier-than-air. A term applied to all aircraft whose power of ascent is not derived from gas that renders their displacement lighter than air.

Helicopter. An aircraft deriving lift from revolving wings or blades that are engine-driven around a vertical pylon.

High speed stall. A stall occurring when the speed becomes so great as to induce a separation of the laminar air flow from the lifting surfaces.

Home. To fly toward a radiation-emitting source.

Horizontal stabilizer. An aircraft's tailplane.

Hose nose. Pilot dressed in helmet and oxygen mask (*slang*).

Courtesy Convair

Hose nose equipment for high-altitude flight

Howgozit. A chart indicating fuel consumption and distance flown (*slang*).

Hydromatic propeller. A hydraulically operated constant-speed propeller.

Hypoxia. Oxygen deficiency in the blood, cells, or tissues.

Icing. Propensity of propeller blades or wings to collect ice in flight.

Indicated air speed. The air speed shown by an air-speed instrument, not calibrated for error.

Inherent stability. That characteristic of airplane design that causes a trimmed airplane, when disturbed in normal flight, to return to straight and level flight.

Instrument conditions. Weather conditions necessitating flying solely by reference to cockpit instruments.

Isogonic lines. Lines crossing the earth's surface from magnetic north on which the degree of compass variation is the same.

Jet propulsion. A means of propelling aircraft by reaction engines on the principle of Newton's third law of motion—*i.e.,* for every action there is an equal and opposite reaction.

Jet stream. A circumpolar whirl of air of exceptional velocity near the base of the stratosphere.

Jump take-off. A take-off made in a helicopter nearly vertically.

Keel. The center bottom of any aircraft.

Kite balloon. A form of captive balloon, with lifting power derived partly from the buoyancy of its gas and partly from air pressure.

Knots. A measurement of speed in aircraft.

Laminar flow. A smooth flow of air adhering to the surface of an airfoil.

Landing gear. Undercarriage.

Landing speed. The speed of an airplane at touchdown.

Lateral control. The control exercised over the attitude of an aircraft through the ailerons.

Lateral stability. Ability of an aircraft to fly in a level-wing position.

Leading edge. Of a wing, the forward edge.

Lenticular cloud. One shaped like a double convex lens.

Level off. Assuming a level flight position after a glide or climb.

Lift. The force exerted by the air on an airfoil in a direction perpendicular to the motion.

Lighter-than-air. A term used to denote all aircraft with a buoyancy that causes them to weigh less than the air they displace.

Line of position. A line along which an aircraft is known to be, used in fixing position.

Line squall. Localized storm front.

Lobe. A pattern of electromagnetic waves, radiated especially by radar antennas.

Longeron. Any heavy longitudinal structural member in an aircraft fuselage or nacelle.

Longitudinal axis. An imaginary line drawn through an aircraft from wing tip to wing tip on which an aircraft rolls in a glide or climb.

Longitudinal stability. Ability of an aircraft to fly hands-off without a gain or loss of altitude.

Loop antenna. A directional antenna.

Loran. A pulsed, long-range navigation system using a series of shore stations for transoceanic aircraft.

Low. A barometric area of low pressure.

Low wing. An aircraft with a wing running across the bottom of the fuselage.

Lubber line. Vertical line in the middle of a compass face.

Mach (Mach number). A number expressing the ratio of the speed of a body through the air to the speed of sound; a Mach number of .9 means approximately 685 m.p.h. at sea level under standard temperature conditions.

Magnetic course. A compass course related to magnetic north.

Magnetic variation. The number of degrees by which a compass fails to point to true north.

Maximum range. The longest distance which an aircraft can fly.

Medium range weather forecast. A forecast of conditions covering a period of twelve to forty-eight hours ahead.

Mice. Tail pipe inserts in a jet engine that facilitate adjustment of nozzle area for maximum thrust.

Minimal flight path. The course that must be flown between two points to cover the distance in the shortest possible time.

Minimal flying speed. The lowest speed that an aircraft can maintain in level flight.

Monocoque. A type of construction in which the airplane skin bears most of the stresses in the fuselage shell.

Mush. To lose altitude when an aircraft drops below minimal flying speed.

Navascope. An airborne radarscope.

Navigation light. Lights mounted on the exterior of an aircraft to make its dimensions and position obvious at night.

Near miss. A near-collision between two aircraft.

Net jet thrust. The thrust of a jet engine when the ram drag has been subtracted.

Ninety-degree approach. An approach for a landing in which an aircraft makes a turn of 90 degrees just before touchdown.

Non-rigid. A term used for balloons, self-propelled, that have no internal framework.

Normal spin. A spin in which recovery can be made in two revolutions of the aircraft.

Northerly turning error. Error found in a magnetic compass in a turn as the needle seeks lines of magnetic force.

Nose heavy. An aircraft condition in which the center of gravity is too far forward of the wing's center of pressure.

Occlusion. A weather situation in which a mass of warm air is shut off from the earth's surface.

Omnibearing. A bearing toward an omnidirectional radio range station.

Omnidirectional. Sending, radiating, or receiving equally well in all directions.

Orientation flight. A flight given a person to familiarize him with a particular aircraft.

Ornithopter. A flapping-wing aircraft.

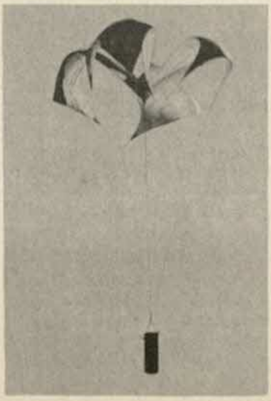
Override. To cancel out the influence of an automatic control manually.

Packplane. An aircraft with a detachable main cargo compartment.

Pancake. To descend at too great a sinking speed.

Panel aircraft. A large aircraft having a separate instrument panel for a flight engineer.

Parachute. A canopy of fabric attached by cords to



A parachute for paratroop and cargo air drop spins like a helicopter rotor a pilot's body or to an object to slow the rate of fall when descending from an aircraft.

Parachute drag. A deceleration parachute used by some aircraft to shorten the landing run.

Parasite drag. All resistance to the air set up by an aircraft's parts other than by the wings.

Parasite plane. An aircraft designed to be carried by, and be launched from, a carrier aircraft in flight.

Passenger mile. One mile flown by one passenger.

Payload. In commercial aviation, that part of an aircraft's disposable load that produces revenue.

Pilotage. Navigation of an aircraft by reference to ground objects.

Pilot balloon. A small balloon sent up before an ascent to see in which direction and at what velocity the wind is moving.

Pilot rating. Certification of pilots for kinds of flying or types of aircraft.

Pip. A blip, a signal on a radarscope.

Pitch. To plunge in a fore and aft direction, nose up or down.

Pitot tube. A tube with an open end facing the wind; combined with a static pressure tube, it is used to measure plane speed.

Pod. A streamlined housing for something carried externally on an aircraft, such as an engine.

Power approach. A landing approach under engine power.

Power loading. The gross weight of an aircraft divided by the brake horsepower.

Precipitation static. Static resulting from snow, rain, hail, or dust.

Pressure gradient. Decrease in pressure between isobars on a weather map.

Propeller. A power-driven, rotating device having a hub and two or more airfoil-shaped blades, used to propel an aircraft by displacing air.

Quadricycle landing gear. An undercarriage consisting of four separate wheel units.

Radar. A device to beam radio frequency energy and catch its reflection; used for navigating and other purposes.

Radial engine. An engine with one or more stationary rows of cylinders arranged radially around a common crankshaft.

Radial flow compressor. A centrifugal compressor in which air is drawn into a rotating impeller axially and discharged radially at the circumference into a diffuser; there velocity is converted from kinetic energy into pressure energy.

Radiosonde. An air-borne meteorograph that automatically transmits weather information.

Radome. A protective covering for a radar antenna.

Ram. The effect of the forward motion of an air scoop; *i.e.*, ram air.

Ram jet. The simplest of jet engines, essentially a tube open at both ends in which fuel is burned to produce thrust.

Rate-of-turn indicator. An instrument to indicate the velocity with which the nose of an aircraft swings in a turn.

Rate-of-climb indicator. An instrument to indicate the velocity with which an aircraft ascends or descends.

Reciprocating engine. An engine in which power is produced by the back-and-forth movement of pistons.

Reverse pitch. Propeller blade position when the angle of attack is negative.

Rib. Of a wing, a light transverse member giving the desired cross section.

Ripping panel. A seam in the upper part of a free balloon which can be torn open to let lifting gas escape and hasten descent.

Rotary wing. The lifting surfaces of a helicopter or Autogiro.

Rudder. A subsidiary airfoil by which an aircraft is made to turn when the wings are banked.

Runway. A surfaced area for landings and take-offs.

Safety pilot. A safety observer qualified as a pilot who can take over the controls on a flight if necessary.

Sailplane. A glider with an exceptionally low sinking speed, thus adapting it to soaring.

Scale effect. Differential between the performance of a model and a full-scale aircraft in standard air.

Seaplane. An aircraft that operates from water.

Sensitive altimeter. A height-indicator with extra-fine graduations.

Separation. A protective device employed to prevent aircraft collisions; there are time, distance, and altitude separations.

Shock wave. A boundary surface across which a flow of air changes discontinuously in pressure, velocity, density, temperature, and entropy.

Sideslip. To move broadside to the line of flight.

Sinking speed. The velocity at which an aircraft moves downward vertically.

Skid. Opposite of sideslip; drifting toward the outside of a turn.

Slot. An opening near the leading edge of a wing to prolong the laminar flow of air.

Snap roll. A maneuver in which an aircraft turns full circle rapidly around its lateral axis.

Span. Length of an aircraft's wing.

Spar. Any principal structural member in an airfoil.

Speed of sound. See *Mach.*

Spin. A maneuver, controlled or uncontrolled, in which an aircraft revolves around its vertical axis with the nose pointed downward.

Split flap. A high-lift device in the operation of which the trailing edge of the wing is not involved.

Spoiler. A projection on an airfoil to decrease lift and hasten descent.

Stall. A flight condition in which the laminar flow of air is destroyed, with a consequent loss of lift.

Stall fence. A barrier on the top of a swept-wing airfoil to discourage the spanwise movement of air.

Standard air. Air at sea level at 59 degrees F.

Stator. Fixed blades between stages of compressor blades, especially in gas turbine engines, to stabilize the air.

Subsonic. Below the speed of sound.

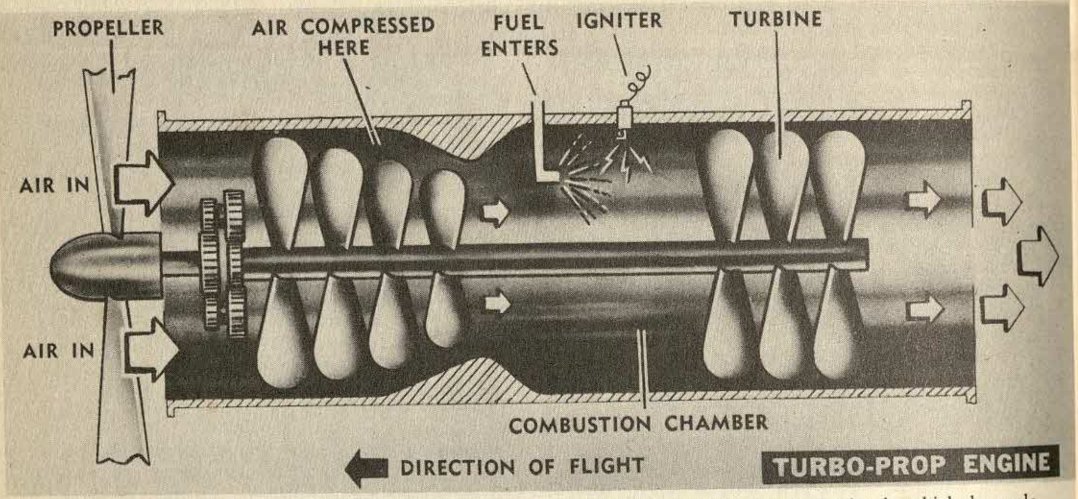
Substratosphere. A high-altitude region of the atmosphere just below the stratosphere; the stratosphere in general can be said to be in the region of 40,000 ft., but its base moves up and down with season and latitude.

Supersonic. Above the speed of sound. See *Mach.*

Sweepback. The backward slant of a wing or other airfoil surface, the amount of which is determined by the angle between a line perpendicular to the plane of symmetry and a reference line in the airfoil.

Tab. A small, auxiliary control surface.

Tail pipe. The exhaust portion of an engine's plumbing.



TURBO-PROP ENGINE

Take-off. To get an aircraft air-borne.

Taxi. To move an aircraft along the ground under power.

Temperature gradient. Rate of change in temperature between one point and another, especially with reference to height.

Terminal velocity. Speed in dive at which air resistance prohibits an increase in speed.

Thermal currents. Upward-moving currents of air.

Thrust. The displacement of air by a propeller or the reaction to the discharge of gases by a jet engine.

Torque. Tendency of an aircraft to slew off in a direction opposite to that in which the propeller turns; in mechanics, a moment of rotation or torsion produced as in a propeller shaft driven by a tangential force.

Touchdown. Landing.

Trailing edge. The after-edge of an airfoil.

Transonic speed. A speed at which an aircraft moves when one or more local points on it are moving at subsonic speed while one or more other points move at sonic or supersonic speed.

Tricycle landing gear. A three-point undercarriage in which no tail skid or wheel is used.

Troposphere. The lower layer of the earth's atmosphere.

Turbofan. A fan used in a ducted-fan jet engine to displace air, increase speed, and reduce fuel consumption.

Turboprop. A combination of gas turbine and propeller for propulsion.

Turbojet. An engine (or aircraft) gaining propulsion by reaction.

Turbulence. Air currents.

Turn-and-bank indicator. An instrument showing the degree of turn and amount of bank.

Undercarriage. Landing gear.

Undershoot. To land or crash an aircraft short of a runway.

Updraft. Upward-moving current of air.

Valve. In a balloon, a controlled aperture for the exit of gas; in hydraulic systems, a modulation for the oil pressure; in engines, a modulation for fuel and lubricants.

Variable-incidence wing. A wing in which the angle of attack may be rotated around the longitudinal axis of the aircraft.

Vector. To guide an aircraft from one point to another by instructing the pilot what heading to take.

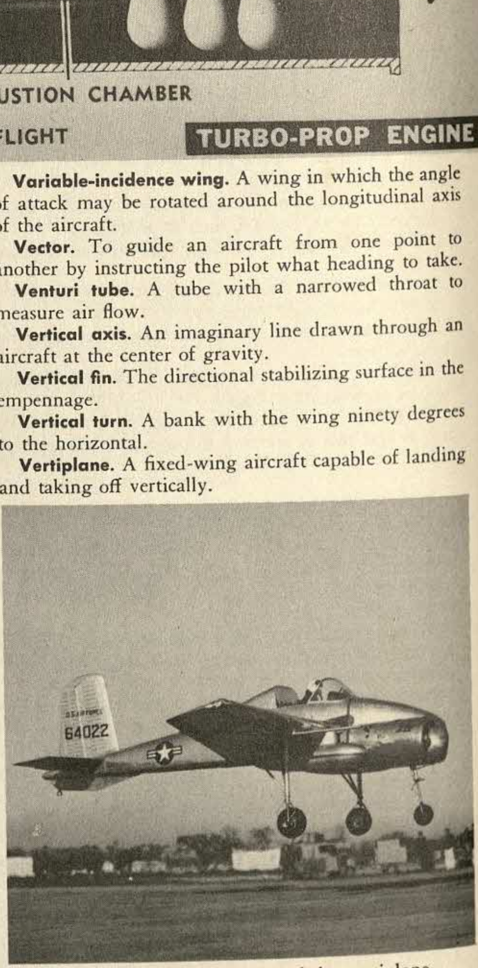
Venturi tube. A tube with a narrowed throat to measure air flow.

Vertical axis. An imaginary line drawn through an aircraft at the center of gravity.

Vertical fin. The directional stabilizing surface in the empennage.

Vertical turn. A bank with the wing ninety degrees to the horizontal.

Vertiplane. A fixed-wing aircraft capable of landing and taking off vertically.



The Bell Aircraft version of the vertiplane

Visual-aural radio range. Radio signals that reproduce themselves on an instrument panel and in earphones, especially those defined as being of very high frequency (VHF).

VFR. Visual flight rules, restricting aircraft to conditions of "contact" flying.

Supersonic wind tunnel simulates 1,300-m.p.h. speed

Warm front. The frontal surface of a warm air mass that is displacing a colder air mass.

Wash. The surge of air disturbed by the passage of a body, such as an aircraft, through it.

Washout. A warp in a wing decreasing the angle of attack toward the tip.

Water injection. Injecting water into the combustible mixture in an engine to improve combustion, provide additional cooling or increase power.

Whipstall. A maneuver in which an aircraft climbs near-vertically, stalls, and drops suddenly, nose down.

Wind correction angle. Degree to which correction must be made to steer a course in a side wind.

Windmilling. The "free-wheeling" of a propeller or rotor system.

Wind tunnel. A large tube for testing aircraft under static conditions.

Wing loading. Gross weight of an aircraft divided by the square feet of wing area.

Yaw. The movement of an aircraft around its vertical axis, taking nose and tail back and forth out of line of flight.

Zero Reader. A gyroscopic instrument combining the functions of a gyro horizon, directional gyro, magnetic compass, sensitive altimeter and cross-pointer landing indicator.

Zero-zero. A weather condition of no ceiling, no visibility.

Zoom. To climb briefly at a higher angle of attack than is normal.

See also *Rocketry* (Rocket and Missile Glossary).

Avicenna (*ăv-ĭ-sĕn'ą*), also known as IBN-SINA, physician and philosopher, born in Efsene, near Bukhara (now in the Uzbek S.S.R.), in 980(?); died in 1037. It is known that he studied in Bukhara, traveled widely, and was awarded a court position in Hamadan, then held by the Arabs. He fell victim to the political feuds among Arabian rulers and about 1024 was able to settle in Isfahan, Persia.

Avicenna's fame rests on his work as a physician and on the medical and scientific literature he left. His system of medicine was incorporated in "The Canon of Medicine," which was regarded as a standard textbook and was repeatedly translated. All in all, he wrote about 100 books, covering all fields of science and philosophy. His philosophical doctrine—sometimes referred to as Avicennism—was based on Aristotle and, today, would be considered an attempt to reconcile religion with the sciences.

Avidalbumin (*ăv'ĭd-ăl-bū'mĕn*). See *Biotin.*

Avignon (*ȧ-vē-nyôṉ'*), a city in France, capital of Vaucluse department, situated on the Rhone River where it meets the Durance River, 28 m. N.W. of Marseilles. Commercially important, the city has food-processing plants and manufactures silk and leather goods. An ancient city which was held by many conquerors in succession, Avignon was an independent republic in 1135-46. In 1226 it resisted the crusade against the Albigenses (*q.v.*). The surrounding historical region of Comtat Venaissin (roughly the present department of Vaucluse) became papal territory in 1274 and was finally annexed to France in 1791. Avignon, however, did not become papal property before 1348. During the years when the popes and anti-popes resided at Avignon—1309-77 and 1378-1408, respectively—the city achieved its greatest renown.

Many beautiful structures remain from Avig-

AVIGNON. PALACE OF THE POPES

This Gothic castle combines two main buildings: the Old Palace, erected by Pope Benedict XII (1334-42) and the New Palace erected by Pope Clement VI (1342-52)

non's great past. Near it, on the way to Nîmes, is the "Pont du Gard," a three-tiered aqueduct (*q.v.*) built by the Romans; and outside the city is the Pont d'Avignon, made famous in many songs. The palace of the popes is an enormous building, which, like much of the city itself, shows its feudal origin. The Calvet Museum houses 14th-century paintings. Population, 1954, 62,768.

Avitaminosis (*ā-vī-tă-mĭn-ō′sĭs*), in medicine, the deficiency or total lack of certain vitamins and any disease resulting from this lack.

Avogadro (*ä-vō-gä′drō*), AMEDEO (CONTE DI QUAREGNA), chemist and physicist, born in Turin, Italy, Aug. 9, 1776; died there, July 9, 1856. One of the principal founders of the atomic-molecular theory of matter, Avogadro was professor of mathematical physics at the university in Turin after 1820. In 1811 he proposed a theory of gases which contained three basic postulates: (*1*) under the same conditions of temperature and pressure, equal volumes of all gases contain equal numbers of particles; (2) in some gases the constituent particles consist of groups of atoms that act together (these are now called molecules), while in others the basic particles are the atoms themselves; (*3*) the chemical reactions that take place among gases follow the simplest schemes that combine the known ingredients to yield the known products. Avogadro himself was not able to determine the number of molecules in a given gas sample, but subsequent findings show that, at 0° C. (32° F.) and under atmospheric pressure, every gas contains precisely 2.69×10^{25} molecules per cubic meter. In chemistry, which is largely based on Avogadro's ideas, *Avogadro's number* is the number (6.023×10^{23}) of molecules in each gram-molecular weight of any substance.

Avoirdupois (*ăv-ẽr-dū-poiz′*), a standard of weights used for all articles of merchandise, except gems, medicines, and precious metals. The grain is the foundation of both the troy and avoirdupois systems. In avoirdupois weight the pound is divided into 16 ounces, the ounce into 16 drams, and the dram into 27 11-32 grains.

Avon (*ā′vŭn*), the name of several rivers in Europe, including one in France and several in the British Isles. The most important is the Avon River in England, which rises in Leicestershire, flows past Stratford, the birthplace of Shakespeare, and enters the Severn at Tewkesbury. It has a length of 100 m., and its valley is noted for fertility.

Avon, FIRST EARL OF, statesman. See *Eden, Sir* (*Robert*) *Anthony, First Earl of Avon.*

Avoset (*ăv′ō-sĕt*), or AVOCET, the name of a bird belonging to the order of the *grallatores,* and represented by one species in America and one in Europe. The structure is quite similar to that of the snipe. The bill is long and feeble, the legs are long, the feet are webbed, and the plumage is variegated with black and white. These birds frequent low and marshy places, where they feed on worms, insects, mollusks, and aquatic animals. The avoset is a common bird in many parts of the U.S. and Canada, but is met with most extensively in the regions of large marshes. The flesh is highly prized as food.

Ax (*ăks*), an instrument for cutting or chopping wood or timber, usually made with an iron head and a handle of wood. One edge is sharp for cutting. The ax is used with both hands, but a smaller instrument called a *hatchet* is intended for one hand. It has been in use from remote times, forming a useful implement for savage and civilized people. The first axes were made of flint rock, later of bronze, and finally of iron. In modern times axes came to be made of wrought iron with a cutting edge of steel, while some kinds have two cutting edges. The American Indians made hammers and hatchets of stone, the latter being popularly known as *tomahawks.* The *adz,* a tool used by carpenters for smoothing timber, has a chisel-shaped edge from 4 to 5 in. long.

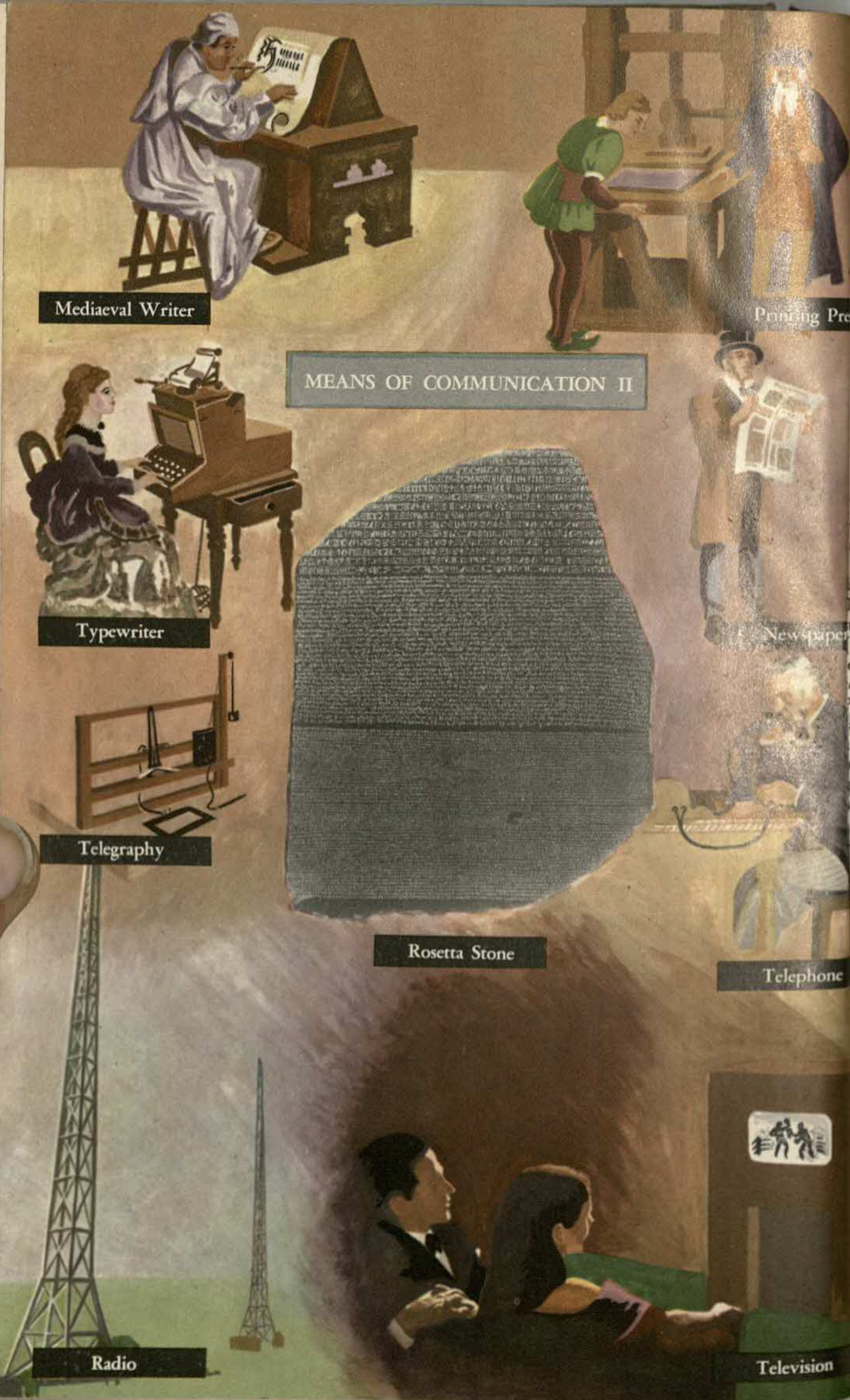
Axiom (*ăks′ĭ-ŭm*), a mathematical and philosophical term. In both cases it means a statement or set of unproved propositions so obvious that it neither can be nor has to be proved. All other problems in mathematics as well as in philosophy have to be proved and are derived from the axioms by logical conclusions. In mathematics, these undefined and undefinable postulates are recognized as such. However, certain developments in modern physics and mathematics associated with the work of Planck and Einstein have shattered the belief in any axiom in the field of mathematics.

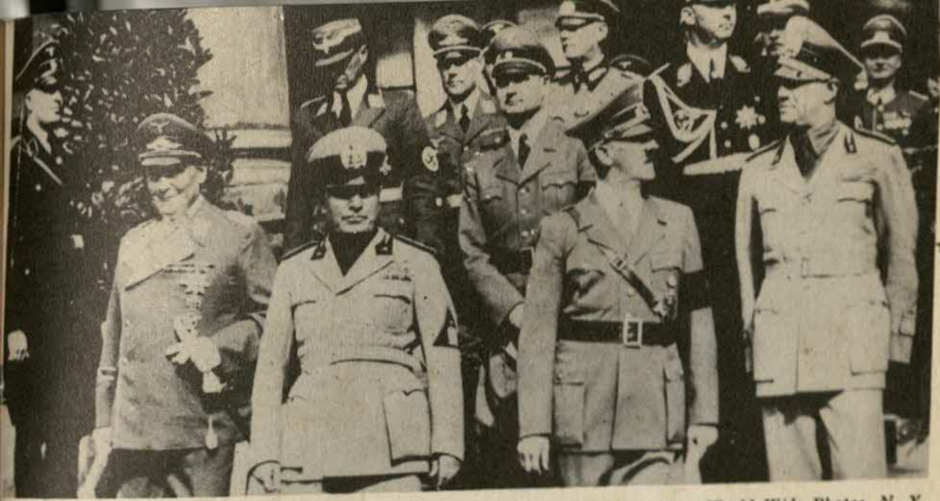
In philosophy, however, not all schools of thought and individual philosophers agree on the existence of such ***a priori*** (*q.v.*) statements. They believe that axioms exist only for mathematics and that every statement in philosophy has to be proved. The question of whether axioms exist at all for philosophical thinking and if so what they are and how far they go is one of the main topics of critical philosophy. Differences of opinion on this question are characteristics of the various systems of philosophy. See *Epistemology; Philosophy;* also articles of individual philosophers.

Axis (*ăks′ĭs*), a straight line, either real or imaginary, drawn through a body, around which that body may revolve. The term is applied in geometry to a line imagined drawn through a plane figure, about which the parts of the figure or body are symmetrically arranged. In botany the term is applied to the central portion of the higher plant, on which are borne the appendages or lateral members. The root is termed the *de-*

MEANS OF COMMUNICATION I

MEANS OF COMMUNICATION II





Courtesy World Wide Photos, N. Y.

AXIS PARTNERS MEET IN MUNICH, 1938

In the front row, from left to right, are Hermann Goering, Benito Mussolini, Adolf Hitler, and Count Galeazzo Ciano

cending axis, and the stem the *ascending axis.*

Axis Powers, term signifying the close col- aboration of Nazi Germany and Fascist Italy. The term was coined in 1936 to express the pre- umption of Hitler and Mussolini that Europe and the rest of the world) must group them- elves about the north-south axis that virtually onnects Germany and Italy. The term Axis Powers or Axis Partners was extended to include apan, when the three nations signed a mutual ssistance pact, the so-called Tri-partite Pact, Sep- ember 1940. The satellite states of these three great powers, *e.g.*, Rumania, Croatia, Manchukuo, oon became "junior partners" of this alliance.

Ayacucho (*ī-à-k͞oo'chô*), a city of Peru, capital of a department of the same name, 240 m. S.E. of Lima. It is located on a tributary of the Mantaro River, about 7,500 ft. above the sea, and the surrounding country is agricultural. In 1824 it was the scene of a battle between the allied forces of Peru and Colombia and the Spaniards, in which the latter were defeated. Population, *ca.* 20,000.

Aydelotte (*ā'dę-lŏt*), FRANK, educator, born in Sullivan, Ind., Oct. 16, 1880; died in Princeton, N.J., Dec. 17, 1956. Educated at Indiana and Harvard universities, he was a Rhodes scholar at Oxford in 1905-07. Returning to the U.S., he taught English at Indiana Univ. and the Massachusetts Inst. of Technology, then became Amer-

JAPAN JOINS AXIS POWERS IN 1940

Ambassador Saturo Kurusu reads Japan's declaration following announcement of the Tri-partite Pact in Berlin. Count Ciano, Italian foreign minister, and Adolf Hitler are seated at his left

Courtesy Press Association, N. Y.

ican secretary to the Rhodes Trustees in 1918, a post he retained until 1953. He was president of Swarthmore Coll. (1921-40), developing there a widely imitated "honors" system giving better students wider freedom in their work. He was director of the Inst. for Advanced Study at Princeton, N.J. (1939-47), when, in 1945, President Truman appointed him one of the six American representatives on the Anglo-American Committee of Inquiry on Palestine. Aydelotte was a steady contributor to many magazines and wrote, among other volumes, "Elizabethan Rogues and Vagabonds" (1913), "The Oxford Stamp" (1917), and "Breaking the Academic Lock Step" (1944).

Aye-Aye (*ī'ī*), a small quadruped native to Madagascar, so named from its peculiar cry. It belongs to the lemur family, is about the size of a hare, and has a long bushy tail. The fingers are long, which it uses to secure the grub of wood borers, upon which it feeds, but it also eats fruits and the tender part of plants. During the daytime it sleeps and at night it goes out in search of food.

Ayr (*âr*), a seaport of Scotland, in Ayrshire, at the mouth of the Ayr River. It is located about 35 m. w. of Glasgow, with which it has connection by railway. The buildings include an academy, a public library, and several churches. The manufactures include carpets, boots and shoes, textiles, and earthenware. Having a good harbor on the Firth of Clyde, it exports coal and imports grain and iron ore. The cottage in which Robert Burns was born is about 2 m. s. of Ayr, and near it are the Alloway Church and the Doon of Tam o'Shanter. Population, *ca.* 35,000.

Ayres (*ârz*), LEONARD PORTER, economist, born in Niantic, Conn., Sept. 15, 1879; died in Cleveland, Ohio, Oct. 29, 1946. Educated at Boston Univ., he became a teacher in Puerto Rico in 1902, general superintendent of the Puerto Rican schools in 1906, and, soon afterwards, chief of the Division of Statistics on that island. Returning to the U.S., he became (1908) director of the department of education of the Russell Sage Foundation, and in 1920 he joined the executive board of the Cleveland Trust Co. Director of several railroads and member of the Research Council of the American Bankers' Assn., he was called upon to serve as economic adviser to the Dawes Commission in 1924. As a colonel in the O.R.C., U.S. Army, he went on leave from the Cleveland Trust in 1940 to return to active service as head statistician in the Assistant Secretary of War's office. In that position, he worked as chief statistical officer for the U.S. Army and later as chief statistician for the A.E.F., with a promotion to brigadier general in 1941. He retired from active service in 1942, but during the war continued to serve as director of the division of statistics for the War Industries Board, the Priorities Board, the Council for National Defense, and the Allies Purchasing Commission. Ayres was known as an influential member of several educational and economic associations, and is considered an authoritative spokesman for American capital. In addition to his other activities, he wrote extensively on economics. Died 1946.

Azalea (*ȧ-zā'lê-ȧ*), a genus of plants of the heath family, many species of which are cultivated in greenhouses and flower gardens for their beautiful and fragrant flowers. Fully 100 species have been described, though only a small proportion has been developed into cultivated plants. The flowers form in profuse clusters and in color are either purple, orange, white, or variegated. They thrive best in a sandy soil of peat or loam, and are well adapted to cultivation in shaded places. The azaleas are native to America and Eurasia; all the American species are deciduous.

AZALEA

Azaña (*ä-zän'yä*), MANUEL, politician, born Jan. 10, 1880; died November 1940. An obscure playwright and author, he took a vigorous stand against the narrow-mindedness of the Spanish aristocracy and became a leading spirit of the republic in 1931. Appointed premier under President Zamora, he was temporarily ousted in 1933, when he formed the Left Republican party. The Popular Front landslide of 1936 brought him back to office. He was elected president of the Spanish Republic in May of the same year and upon the outbreak of the civil war established a government-in-exile in France. He resigned only after France and Britain had recognized the Franco regime. See *Spain*.

Azariah (*ăz-ȧ-rī'ạ*), a name in common use among the Jews, and applied in history to a number of Hebrew rulers. The most important personage bearing this name was Uzziah, the 10th King of Judah, who reigned about 809 B.C. In Scripture the name is also applied to a Chaldean friend of Daniel, to a high priest who aided Hezekiah in the temple worship, and to a prophet who met Asa after the latter won a victory over the King of Ethiopia.

Azerbaijan (*ä-zẽr-bī-jän'*), **Soviet Socialist Republic,** one of the constituent republics of the U.S.S.R.; area, 33,000 sq. m.; population over 3,000,000. It is situated west of the Caspian Sea and north of Iran. Baku (population over 800,000), the capital, is a great oil-producing Caspian seaport. Azerbaijan includes the Nakhichevan Autonomous Republic, which is separated from the main body of the country by a strip of Armenian territory, and also the Nagorns-Karabakh Autonomous Province. Azerbaijan has extensive mineral deposits. Most important are the oil fields in the Baku region, which are among the world's richest. In the Caucasus Mts. cattle-raising is highly developed; the wooded foothills are dotted with orchards, vineyards, and tobacco plantations. Tea, grain, and citrus fruits are grown in the Lankoran Valley in the extreme southeast, while the Caspian fisheries are of great economic importance. Education has made vast strides in Azerbaijan; in 1947 there were 534,000 pupils in elementary and secondary schools. Eighteen colleges and universities have been founded, and more than 90 technical institutions have been established by the Soviet Government.

Having separated from Russia after the overthrow of the Czar in 1917, Azerbaijan, like the other non-Russian areas of the empire, established its own Soviet regime in 1920 and in company with the other Transcaucasian nationalities joined the Soviet Union when it was formed in 1922. It received the status of a Union republic on Dec. 5, 1936. See also *Iran*.

Azilian (*ȧ-zĭl′yạn*), a prehistoric culture of Mesolithic (*q.v.*) times. It is characterized by flat tools (harpoons) and small painted pebbles. Traces of it have been found in northern Spain, the French Pyrenees, eastern France, Belgium, and Britain.

Azimuth (*ăz′ĭ-mŭth*), a word of Arabic origin designating the angle between the direction of an object and that of the meridian, measured in a clockwise direction along the horizon.

Azoic (*ȧ-zō′ĭk*). See *Archaean*.

Azores (*ȧ-zōrz′*), an island group in the Atlantic Ocean, situated west of Portugal, and forming a part of that republic. The islands nearest Portugal are about 800 m. w. from the coast, but the entire group is considered as belonging to Europe. These islands are of volcanic origin and are subject to earthquakes. Pico Alto, the highest volcanic summit, has a height of 7,460 ft. Pico, São Miguel, Santa Maria, and Terceira are the most important islands, and the entire group embraces an area of 922 sq. m. The chief productions are tropical fruits, cereals, vegetables, and live stock. Vegetation partakes of luxuriant forms, the soil is fertile, and the climate is favorable to Europeans. The larger part of the inhabitants are Portuguese and Spaniards, most of whom are quite poor. Appearing on a map for the first time in 1351, the Azores were visited by Portuguese explorers in 1432 and the islands were annexed to Portugal. At that time they were entirely uninhabited by man, but plants, birds, and small quadrupeds were abundant. A species of hawks, called *açores* by the Portuguese, gave the name to the islands. From 1580 to 1640, the Azores, like the other possessions of Portugal, belonged to Spain.

A famous sea battle, part of the contest between England and Spain for trade supremacy, took place at Flores in 1591 between the English ship *Revenge*, commanded by Sir Richard Grenville, and 53 Spanish vessels. In 1943, Portugal gave Great Britain the use of the Azores as an Allied air and naval base in World War II, on the basis of a 570-year-old British-Portuguese treaty. Ponta Delgada is the capital and chief town, but Angra is the usual residence of the governor. Population, 1940, 485,278.

WIND GOD OF THE AZTECS

Azov (*ä-zŏv'*), or AZOF, an inland sea of southern Russia, forming a branch of the Black Sea, with which it is united by the Strait of Kerch. Though the sea is comparatively shallow, it is valuable for navigation by vessels of small draught, and yields an abundance of fish. Its greatest length is about 230 m.; breadth, 112 m.; and area, 14,000 sq. m. The water is nearly fresh, owing to the large inflow from the Don River and several minor streams. In the Crimean War, in 1855, the Sea of Azov was the seat of great naval activity, which was directed with the view of cutting off the food supply and otherwise affecting Sebastopol.

Aztecs (*ăz'tĕks*), the name of the inhabitants of Mexico at the time of the Spanish invasion in 1513. Though the name is frequently applied to all the native inhabitants of Mexico at that period, it strictly belongs to only one of a number of tribes. According to tradition, the Aztecs came from a country which they named *Aztlan,* a region reputed to be situated northwest of Mexico, though its exact location has never been ascertained. The date of the exodus from Aztlan is fixed at 1164 A.D., and their arrival in the valley of Mexico is placed at 1216, when they succeeded the Toltecs, a superior race. In 1325 they founded the City of Mexico, naming it the City of Tenochtitlan from their chief Tenoch.

At the time of the Spanish invasion the City of Mexico offered considerable resistance to the Spaniards, owing largely to strong natural and artificial fortifications, and partly to the overwhelming numbers of the Aztecs. After successive assaults the city was occupied by the invading army under Cortez. At that time the people were given to war and idolatry, but they had obtained marked advancement in astrology and astronomy, taught the arts of reading and writing, and possessed considerable knowledge of architecture. They maintained many temples, which were built on substantial terraced pyramidal bases, numerous ruins of which still remain. The horse, ox, and other domestic animals were unknown to them, but, notwithstanding this disadvantage, they evidenced material advancement in agriculture, and cultivated large tracts of land in maize and agave. They possessed material skill in weaving, feather work, pottery, and metal work.

Much of the history of the Aztecs was recorded in hieroglyphics on the walls of temples and pyramids, and they not only prepared lunar calendars, but devised astronomical apparatus and designs of considerable value. At the same time, they were given to superstition, and sacrificed human beings to their gods. Their legendry was quite extensive, containing numerous interesting details and accounts of heroes, teachers, and priests. The education of the young devolved on a priesthood, which they supported by tithes. Their last ruler, Montezuma, was reigning when the Spanish made their invasion under Cortez. He was imprisoned and afterward killed by the Aztecs in their revolt against Spanish dominion. These people are of great interest to the student of history, since their civilization and government, though springing up mysteriously, resembled in many respects the archaic Oriental institutions.

For illustration see preceding page.

Azurite (*ăzh'ū-rīt*), a carbonate of copper, found as an ore of copper and as an ornamental stone. It is crystalline, deep blue in color, and not hard enough for jewelry. Deposits of it occur in Arizona, where it is found in limestone and is accompanied by other ores of copper, such as limonite and malachite. It occurs in small quantities near Lyons, France, and in Siberia. The Siberian azurite is cut in slabs and used for table tops.

Azymites (*ăz'ĭ-mīts*), the name used by the Greek Church to designate the Roman Catholic Church, because the latter had decided that unleavened bread should be used in the sacrament. The controversy as to whether leavened or unleavened bread should be used began about 1045, when Michael Caerulairus, patriarch of Constantinople, designated the use of unleavened bread as a remnant of Judaism. To this the Latin Church retorted by calling the adherents of the Greek Church Pro-zymites and Fermentarians. The unleavened bread or wafer is still used by the Roman Catholic Church, while many of the Protestant churches use the leavened bread.

B

B (*bē*), the second letter and the first consonant in the English alphabet, and in that of most Indo-European languages. It is a sonant element of speech of the class known as labial mutes. In some languages it is interchangeable with p, especially when it occupies a terminal position in a word or syllable. It is produced mostly by the lips, and combines the utterance of voice and breath. In music B is the seventh note of the diatonic scale of C, in which connection it is termed the *leading note,* calling for the octave C to follow it.

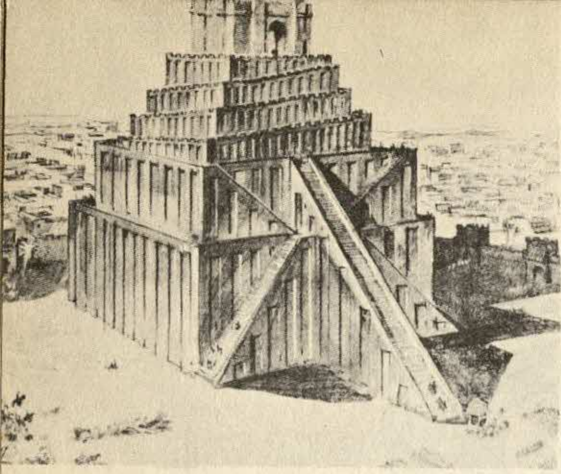
Baader (*bä'dēr*), FRANZ XAVER VON, eminent philosopher and theologian, born in Munich, Germany, Mar. 27, 1765; died May 23, 1841. He was the discoverer of a new method of employing salts instead of potash in making glass, and received a prize of 12,000 gulden, about $5,000, as a reward. He published a number of works on religion, and attained much celebrity by lecturing against church interference in civil matters. Baader ranks as the greatest speculative theologian of modern Catholicism. His best-known work is "Speculative Dogmatism."

Baal (*bā'ąl*), or BEL, a Hebrew and general Semitic term which implies lord, and used to designate different divinities. It was the name of the principal god worshiped in the nations of Canaan and Phoenicia, with whom Ashtoreth ranked as the principal goddess. These people regarded Baal the god of the sun, ruler and life-giver to the universe, and opposed to Moloch, who ranked as the god of destruction. Worship was at first conducted on the mountain tops among the Midianites, Moabites, and other peoples of Western Asia. In Greece the practice of mountain worship was attached to Hercules. Baal was an important divinity among most Semitic peoples, even among the children of Israel, from whose midst his worship was ultimately banished under severe punishment. From the word *Baal* other words commonly used have originated, among them Baalgad, Jezebel, Hannibal, Asdrubel, and Belshazzar.

Baalbek (*bäl'bĕk̨*), an ancient city in Syria, 40 m. N.W. of Damascus, famous for its ruins of magnificent structures of antiquity. One of the chief temples was dedicated to the sun. In its construction, blocks of stone 12 ft. thick and 60 ft. long were used, as is evident from some of the columns and walls that are still standing. In the time of Julius Caesar the city formed a Roman possession. It was sacked by the Arabs in 748, pillaged by Timur in 1400, and completely destroyed by an earthquake in 1759. Some of the ruins are the most massive as well as extensive in the world, among them those of the Temple of Jupiter, which is still larger than the Parthenon at Athens.

Babbitt (*băb'bĭt*) **Metal,** a soft alloy made by melting together two parts of copper, six parts of tin, and four parts of antimony, and then adding six parts more of tin. A little powdered charcoal is used to prevent the metal from oxidizing. Babbitt metal was first made by Isaac Babbitt, a goldsmith in Boston, and is used to reduce friction, abrasion, and heat in the bearings of axles and journals.

Babel (*bā'bẹl*), TOWER OF, a great tower mentioned in Genesis 11. It was situated in the land of Shinar, Mesopotamia, and was built by the descendants of Noah. The tower was to reach unto heaven, but the language of the builders was confused by God, so they could not understand each other, and the work was abandoned. The Babylonians and Greeks had a similar account of a great tower. It is said that when the giants sought to scale the heavens they were overthrown by



RECONSTRUCTION OF THE TOWER OF BABEL

Zeus. Several ancient writings make it probable that the Tower of Babel was located at Babylon, and that it was completed by Nebuchadnezzar, the great king. Tourists are referred to several ruins on the site of the ancient city; those most probably authentic are at a place called Amram, and form a mound 150 ft. high, with a base over 3,000 ft. long and 2,500 wide.

Bab el Mandeb (*bäb ĕl män′dĕb*), meaning "Gate of Tears," a cape and strait at the southeastern tip of Arabia. The strait, some 20 m. wide, is located at the southern entrance to the Red Sea, between that body of water and the Gulf of Aden. The island of Perim (*q.v.*) divides the strait into unequal eastern and western portions. See also *Aden*.

Babington (*băb′ĭng-tŭn*), ANTHONY, public man, born at Dethik, England, in 1561; executed Sept. 20, 1586. He became a page to Mary Queen of Scots, at the time of her confinement at Sheffield, and entered a conspiracy to release Mary and murder Queen Elizabeth. The plot was discovered and Babington and several others implicated were executed about four months before the execution of Mary. It is thought that the latter was implicated and approved of the conspiracy, but this she denied.

Babirussa (*băb-ĭ-rōōs′sȧ*), or BABYRUSSA, a wild hog native to the islands of Buru and Celebes. It has slender legs, is almost without hair or bristles, and feeds upon fruits and plants instead of rooting in the ground. In the male the canine teeth grow upward and form tusks, sometimes from 8 to 10 in. in length, and curve backward like horns. The flesh is eaten by the natives.

Babism (*băb′ĭzm*), the name of a Mohammedan sect founded in Persia in 1844 by the religious reformer Mirza Ali Mohammed (1819-50), known as the Bab (meaning gate or door), who described himself as a manifestation of the same spirit that flowed through Moses, Christ, and Mohammed. Civil strife resulted from the sect's teaching of social equality of the sexes, education for all, monogamy, and abstention from liquor, and the Bab was captured and shot at Tabriz. Babism was then followed by Bahaism (*q.v.*), whose founder, Mirza Husayn Ali, claimed to be the prophet announced by the Bab.

Baboon (*băb-ōōn′*), the name applied to a division of apes and monkeys found in Asia and Africa. They are among the largest of this class of animals and possess great strength. Most species have long, abrupt muzzles, like a dog, short tails, deep eyes, large eyebrows, and strong teeth. They belong to the quadrupeds, run swiftly on all fours, and cannot maintain themselves with ease in an upright posture. They are fierce, ugly, cunning, and dangerous when attacked. Their size is that of a large dog, but the *mandrill,* a species of baboon, is about the size of a man when standing erect. These animals live in colonies or herds, have recognized leaders, and carry on warfare against kindred herds and against other wild animals. Their food consists of twigs, roots, fruits, and grasses, but they sometimes eat lizards, birds, and similar small animals. The *common baboon* is found in large parts of Northern Africa, the *gelada* in Abyssinia, the *chacma* in Southern Africa, and the *black baboon* in Celebes.

Babson (*băb′sŏn*), ROGER WARD, statistician, born in Gloucester, Mass., July 6, 1875. He was graduated from Massachusetts Inst. of Technology (1898) and then wrote articles and columns on business investment. He established (1904) the Babson Statistical Organization, offering the Babson Reports Service, and founded Babson Inst. of Business Administration (1919), at Babson Park, Mass., and Webber Coll. (1927), Babson Park, Fla. His books include "Actions and Reactions" (1935), "If Further Inflation Comes: What You Can Do About It" (1948), "Before Making Important Decisions and Why I Love Gardens" (revised ed., 1954), and "Business Barometers for Profit, Security, Income" (10th ed., 1961).

Babylon (*băb′ĭ-lŭn*), the capital of the Babylonian Empire, on the Euphrates River, anciently one of the largest and most beautiful cities of the world. It was founded by Queen Semiramis, who spent many years and employed thousands of workmen in its improvement. Mention is made of it as a great city as early as 1500 B.C., but its importance dates from about 680 B.C., when it was reconquered by Sennacherib, and made one of the two capitals of Assyria. After the fall of Nineveh, in the time of Nebuchadnezzar, it was improved in magnificent style, and at that time attained its greatest glory. The city was built in the form of a square, each side of which was 15 m. long. High and massive walls fortified it against its enemies, while in it were the most beautiful edifices, terraced structures, pleasure gardens, verdant parks, and the *hanging gardens,* one of the seven wonders of the ancient world. The celebrated Tower of Babel (*q.v.*), a remarkable structure of brick and stone, stood within the city.

Babylon was conquered by Cyrus, King of Persia, in 538 B.C., who entered it by the river channel, having previously turned the water from its course by a great canal. It then became a part of the Persian dominion, and with this conquest began a rapid decline. When Alexander the Great led his expedition into Asia, he found the city greatly damaged, but still beautiful. He undertook to rebuild it with 10,000 men, but after two months' labor gave up the enterprise. Subsequently, the city declined rapidly, crumbling away on account of successive wars. In its ruins were found many curious and valuable relics, among them divers cuneiform inscriptions and casts, some of them throwing much light upon ancient history. Most of the material, such as brick and stone, was used in building up the new city of Seleucia, which was founded by Seleucus, the successor of Alexander the Great.

Babylonia (*băb-ĭ-lō′nĭ-ȧ*), the name of an ancient country on the Lower Euphrates; the region occupied by it is now called Iraq. Ancient writings indicate that the empire was located south of Mesopotamia, west of Assyria, north of the Gulf of Persia, and east of the Desert of Arabia, but during its greatest prosperity it included Assyria, Mesopotamia, and practically all of Western Asia. In sacred history it is referred to as the land of the Chaldees, and also mentioned as Babel and Shinar. The region has ranked for ages as one of the most fertile districts in southwestern Asia. Anciently its fertility depended, not alone upon nature, but a large number of irrigating canals and aqueducts were maintained to supply the soil in arid districts with moisture sufficient to insure production. From the Grecian historian, Herodotus, who made several visits to the site of this once great empire, we learn that it supplied its own people and one-third of the population of Persia with corn and other cereals. Its civilization is as ancient as the civilization of Egypt, perhaps, beginning with the year 4000 B.C., but historic records reveal nothing back of the year 2400 B.C.

PEOPLE. The inhabitants of Chaldea consisted of a mixture of Hamites, Semites, and other classes. Their languages and races were mixed at all times. One of their earliest leaders was a noted hunter named Nimrod, who organized separate tribes under a single government. Later Abraham, the first of the Israelite fathers, ascended the Euphrates and subsequently the Assyrians built great cities on the Middle Tigris. Some writers regard the Babylonians as a branch of the Semitic stock and class the non-Semitic elements as primitive Aryan tribes. Babylon, known to the Hebrews as Shinar, was the capital and largest city of Babylonia. It was the center of Babylonian culture. Besides Babylon, the principal cities were Eurech, Ur, Calneh, Nippur, and Sippara.

N. Y. Zoological Society Photo

BABOON

HISTORY. Little is known of the early history of the Babylonians, though they possessed many works in geography, history, astronomy, and poetry, and accumulated extensive libraries. The earliest writer of whom we have any information is Berosus, a priest, who lived in the time of Alexander the Great, and wrote a history of his country largely from the records of the Temple of Belus. While this work is lost, portions were quoted in other books, and from them we have secured considerable information of the early history and customs. According to this source of information, the Chaldean dynasty reigned from 2001 to 1543 B.C., the Arabian dynasty from 1543 to 1298, and the dynasty of 45 Assyrian kings from 1298 to 772, and that the reign of Pul extended from 772 to 747 B.C. From this history and the descriptions of Herodotus we learn that successive wars brought Babylon and Nineveh into close relationship. Pul reigned 25 years as Emperor of Assyria and Babylonia, and was known in the former by the name of Tiglath-Pileser III and in the latter by the name of Pul.

In 722 Assyrian sovereignty was thrown off under the leadership of Baladan II, but 12 years later Babylonia was again conquered. When the northern neighbor declined, Babylonia regained its power and rose to a height never before attained. Nebuchadnezzar was its greatest king. He reigned from 604 to 561 B.C., reconquered lost provinces, rebuilt canals, erected palaces and temples, constructed great aqueducts and lighthouses, and made Babylon, the capital, once more the greatest city of the nations. He conquered Jerusalem, carried the king and a large portion of his subjects into captivity, and later destroyed the Jewish capital. To gratify his Median wife and remind her of her mountain home, he built great towers, the hanging gardens, and beautiful parks, and ornamented them with rare trees, grasses, foliage, and flowers. After the death of this mighty king, the empire survived but 24 years, when Nabonidus and Belshazzar were conquered by Cyrus the Great, King of Persia, in 538. About two centuries later, in 328, it was made a part of the dominion of Alexander the Great, who undertook to rebuild the capital city, and subsequently was conquered by rulers of Syria, Parthia, Rome, and the caliphs of Bagdad. Later it fell under the dominion of the Turks and Tartars. The only remains that mark the once powerful empire are the ruins of its great cities, and the scattered tribes who descended from the ancient Babylonians.

BABYLONIAN JEWELRY

Bust adorned with headdress, necklace, and earrings worn by Queen Schubad of Ur, 2700 B.C.

Babylonian Captivity (*băb-ĭ-lō′nĭ-ạn căp-tĭv′ĭ-tĭ*), the deportation of a large portion of the leading inhabitants of Judah, by Nebuchadnezzar, in 586 B.C., after the fall of Jerusalem. The term is likewise applied to a prior captivity, in 597 B.C., when many Israelites were deported to Babylonia. While the principal part of the Jews were in captivity, Zedekiah became king over the remainder, but he was vanquished and the kingdom of Judah was brought to an end by the powerful Chaldeans. While in captivity, the Jews were allowed religious freedom. At this time, Ezekiel, one of the great prophets, gave spiritual inspiration to the despondent people, and they were finally liberated when Cyrus overthrew the Babylonian Empire in 538 B.C.

See also *Jews.*

Baccalaureate (*băk̦-k̦ȧ-lạ′rê-ât*), the degree of bachelor such as of arts, science, or philosophy conferred by institutions of higher learning. A baccalaureate sermon is a farewell discourse to a class of graduates, usually delivered the last Sunday before graduation. The baccalaureate is considered the lowest of the academic degrees.

Baccaloni (*bä-k̦ä-lŏ′nĕ*), SALVATORE, opera singer, born in Rome, Italy, April 14, 1900; knighted, 1934. His musical training began at the age of six in the school for choristers attached to the Sistine Choir. His later education, however, was in architecture; he was graduated from the Acad. of Fine Arts in Rome in 1920. He soon deserted his drawing board to become a singer, making his debut at the Adriano Theater in Rome (1921) after studying under a well-known baritone, Giuseppe Kaschmann. Baccaloni was introduced to the head of La Scala in Milan, Italy, by Arturo Toscanini, who later advised him to become a basso buffo (singer of comic roles for bass). Upon the death of the official basso buffo of Milan, Baccaloni succeeded him. He stayed with the company in that capacity for 13 years, singing at other European and American opera houses during the same period. In 1930 he appeared with the Chicago Opera company, and he made his Metropolitan Opera debut in 1940. He remained with the New York company until the early 1950's, singing such roles as *Leporello* in "Don Giovanni," the title role in "Don Pasquale," and *Dr. Bartolo* in "The Barber of Seville."

He was often called one of the finest actors of the operatic stage, and he remained an actor after retiring from opera. His first nonsinging motion-picture role was in "Full of Life" in 1957. Baccaloni estimated that he had sung 170 roles, in five languages, during his long career.

Courtesy Metropolitan Opera Press Bureau, N. Y.

SALVATORE BACCALONI

As *Don Pasquale* in the opera by Donizetti

Baccarat (*băk̦-rä′*), a card game, supposed to have been introduced into France from Italy in the days of Charles VIII (1470-98). There are two generally accepted variations: *baccarat chemin de fer* and *baccarat banque*. Three or six full packs are employed, the bank being fixed or rotating. The banker deals two cards to himself and two to his opponent, who represents both himself and fellow players. The higher hand up to nine (inclusive) wins, counting each card at face value (picture cards are not counted). Values over 10 only count the second digit, *i.e.,* a total of 13 would only count three. The banker must sell a third card upon request and is entitled to a third card himself. A hand adding up to eight or nine with the first buy wins instantly, the other player losing the right to a third card.

Bacchus (*băḳ′ḳŭs*), also called Dionysus, in Greek mythology, the son of Zeus and Semele. He was the god of wine and personification of the blessings of vegetation generally. He was snatched by Zeus from the devouring flame in which his mother perished, when she beheld that deity in all his divine glory. The motherless child was intrusted to Hermes and later taken in charge by Silenus, the son of Pan, and brought up by the nymphs. He led great armies and conquered Damascus and the Amazons. It is related that he taught the culture of the vine and the art of making wine, which soon became a favorite beverage. Being the god of wine, he was calculated to promote sociability, and is represented in statuary in company with bacchantes (maenads), satyrs, and nymphs. The Romans had a divinity called Liber who presided over vegetation. He was identified with the Greek Bacchus and was celebrated at festivals called Liber, on the 17th of March.

Bach (*bäḳ*), JOHANN SEBASTIAN, composer, born in Eisenach, Germany, March 21, 1685: died in Leipzig, July 28, 1750. Generally considered the greatest German composer, with the exception of Beethoven, Bach's position as master of the contrapuntal school of music is undisputed. Music was his natural environment. In the course of seven generations (1600-1845), the family of which he was the most famous member produced some 50 musicians, and at least 20 of them were outstanding among their contemporaries. Bach's immediate family included a father, JOHANN AMBROSIUS (1645-95), who taught him to play the violin, a great-uncle who was a distinguished organist, and an older brother who taught the ten-year-old boy to play the clavichord. Later, four of the master's sons were to carry on the family tradition. Most important among them was WILHELM FRIEDEMANN BACH (1710-84), whose works represent a transition from the polyphonic style of his father to the new instrumental style of the later 18th century, and KARL PHILIPP EMANUEL BACH (1714-88), whose works, though not reaching the stature of his father's, nevertheless showed a genuine musical gift through which he was able to express the ideas of his time in homophonic style.

Johann Sebastian Bach was regarded by his contemporaries as the greatest living organist, as well as the greatest of all composers for that instrument. It is probable that his early training for the church choir—at St. Michael's in Lüneburg—was responsible for his lifelong interest in choral music, and during his three years there (1700-03) he began his first serious study of organ music under George Boehm. When he left Lüneburg, at the age of 18, he was already qualified for the professional career which led him first to the position of organist in several of the smaller German towns. In 1705, at 20, he married his cousin, Maria Barbara, whose father was also one of the musical Bachs. Three years later (1708) he became organist in the Ducal Chapel at Weimar, and during his nine years there his interest as a composer was centered upon works for the organ. His next employment, as *Kapellmeister* at Köthen, included composing for various instruments and resulted in many works for clavichord and orchestra as well as much of his chamber music. Bach's first wife died while he was at Köthen, and in 1721 he married again—this time a singer.

The last and greatest period of the composer's life began when he accepted the position of cantor (choir master) of the School of St. Thomas in Leipzig. Here he wrote the great body of religious works upon which his fame largely rests. Among other types of music also belonging to this period, his "Musical Offering" (1747), a collection of fugues and canons, is one of the most widely known. This work developed out of improvisations on a theme which one of his admirers—Frederick the Great—gave the master during his visit (1747) to Potsdam. A work called the "Well-Tempered Clavichord" (part I, 1722; part II, 1744), inspired by interest in the education of his sons, and consisting of two collections of 24 preludes and fugues for the harpsichord, represents the classical and basic work of keyboard literature.

Bach's compositions are equally important in the field of vocal and instrumental music. The six "Brandenburg Concertos" (1721), composed for a group of various instruments, are today as well known among the best small-orchestral compositions as are his famous "Chaconnes" among works written for the violin. Compositions for various individual instruments, sonatas for the clavichord and violin in combination with other instruments, the so-called "French Suites" and "English Suites," toccatas, fantasias, preludes, fugues, and "inventions"—all show Bach's unexcelled mastership in strict architectural treatment of polyphony. However, no rigidity of form could lessen the emotional impact, the abundance of musical invention, both so characteristic of the great master. The layman may grasp these qualities most easily by following Bach's religious compositions—cantatas and oratorios in which he combines the ultimate

JOHANN SEBASTIAN BACH

in vocal expression with the beauty of individual instruments and the power of the orchestral body. Among his greatest works are the "B-Minor Mass" (completed *ca.* 1738), written for the Catholic liturgy, and a group of oratorios presenting the most monumental musical glorifications of the life of Christ: the "St. John Passion" (1723; final version, 1727); the "Passion According to St. Matthew" (1729), and the magnificent oratorios for Easter (1736?) and Christmas (1734).

Bach's "Art of the Fugue" (1748) is made up of 15 fugues and four canons which were not written for one specific instrument. Finished shortly before his death, it shows his mastery of contrapuntal art at its height. Work on his last composition—a monumental quadruple fugue—was halted by the onset of blindness, followed shortly by his death in Leipzig at the age of 65. During the remainder of the 18th century and the early part of the 19th—the epoch of Gluck, Mozart, Beethoven, and Schubert—the greatness of Johann Sebastian Bach's music was somewhat overshadowed by his successors. It was Felix Mendelssohn-Bartholdy's (*q.v.*) performance of the "Passion According to St. Matthew" in the Berlin *Singakademie* (1829) which initiated the revival of interest in Bach's music—an enthusiasm kept alive, even intensified, through the years. Bach's place in the music world is unique and secure.

Bache (*băch*), ALEXANDER DALLAS, physicist, born in Philadelphia, Pa., July 19, 1806; died in Newport, R.I., Feb. 17, 1867. He was a grandson of Sarah, the only daughter of Benjamin Franklin, who had married Richard Bache in 1767. In 1825 he was graduated with the highest honors from West Point, where he became an instructor. He was professor of chemistry and physics at the Univ. of Pennsylvania (1828-36) and was then elected first president of the Trustees of Girard Coll. In 1843 he became superintendent of the U.S. Coast Survey. His contributions to scientific journals were numerous, and he was an active member of many scientific organizations including the Smithsonian Institution, the National Academy of Sciences, and the American Philosophical Society. His published reports included "Education in Europe" (1839) and "Observations at the Magnetic and Meteorological Observatory at the Girard College" (1840-47).

Bacheller (*băch'ĕl-lẽr*), IRVING, author, born at Pierpont, N.Y., Sept. 26, 1859; died at White Plains, N.Y., Feb. 24, 1950. He was graduated from St. Lawrence Univ. in 1882 and spent some time as a newspaper writer. He was editor of *The Pocket Magazine* and served on the staff of the New York *World*. Besides contributing articles to newspapers and magazines, he published many novels including "Eben Holden," "The Master of Science," "The Still House of O'Darrow," "Darrel of the Blessed Isles," and "The House of the Three Ganders."

Bachelor (*băch'ẹ-lẽr*), a male of marriageable age, but who is unmarried. In a few countries a special tax has been imposed upon male celibates, on the ground that every citizen should bring up legitimate children as a support of the state. In Greece and Rome bachelors were denied many of the privileges accorded citizens. The terms Bachelor of Science (B.S.), Bachelor of Arts (B.A.), and other similar titles are used to designate persons who have completed certain college or university courses of study.

Backgammon (*băk'găm-ŭn*), a game played with dice upon a board or table made for the purpose. The table has two compartments, each with 12 points, six points on each side, or 24 in all, and the points are colored alternately red and black. Two persons play the game, each of whom has two dice, which are thrown with the view of moving the "men" or checkers, of which there are 15 for each player, onward or in such a manner as to bring his own men into his own inner table and to prevent his adversary from doing the same. The game requires skill and has long been a favorite pastime in England, where it is believed to have originated.

Bacon (*bā'k'n*), the name of a kind of cured pork, taken from the sides and back of the hog. It is cut in large pieces and salted in a dry condition, after which it is smoked. The best grade is derived from the part of the hog in which the fat is mixed with lean meat. Large quantities of bacon are prepared in packing houses and sold in markets or exported.

Bacon, AUGUSTUS OCTAVIUS, legislator, born in Bryan County, Georgia, Oct. 20, 1839. He was graduated from the Univ. of Georgia in 1859, was admitted to the bar, and served in the Confederate Army during the Civil War. Subsequently he had an extensive law practice at Macon, and was a member of the State Legislature (1870-93). He was elected U.S. Senator in 1895 and was re-elected in 1901, 1907 and 1913. He died Feb. 14, 1914.

Bacon, FRANCIS, one of the most controversial figures in the history of science and literature, born in 1561. He led the usual life of an Englishman of the higher classes until his 14th year when he went to study philosophy and languages at the Univ. of Cambridge. After a sojourn in France and Paris he returned to England and became a successful jurist. He took a seat in Parliament in 1593. Finally, he became counsellor to the Queen and through the help of his friend, the Earl of Essex (*q.v.*), was knighted in 1603. The climax of his official career came in 1619, when he became Lord Chancellor with the title, Baron of Verulam, later Viscount St. Albans.

Indicted for bribery and misuse of his official powers (1621), he was imprisoned, but soon released. For the second time he was elected to Parliament, and at the time of his death (1626) received a pension from the court and was in full possession of his civil rights. He wrote his greatest number of works in the period after his release from prison.

Historians do not agree about Bacon's guilt—whether he was a corruptible man or not—but no disagreement exists about his importance for the development of science and literature. Like his namesake, Roger Bacon (*q.v.*), his mind was especially comprehensive and he dealt equally with history, archaeology, and natural science. In regard to natural science he is definitely an empiricist. His great idea is the identity of purpose of empiricism (*q.v.*) and speculation (*q.v.*). In his opinion, only their amalgamation leads to real knowledge. His "Novum Organum" which appeared in 1620, and his "Essays" are his best known works, but it must be remembered that Bacon worked in three different directions, publishing literary, philosophical, and professional works, the last concerning matters of jurisprudence.

Bacon became immortal through his philosophical endeavors which may be defined as the foundation of all modern natural science. Since he believes in the unity of all natural science, he actually creates something which we could, in modern times, call a methodology of science. This methodology is based on the capacity of the human mind: Memory, imagination, and reason. Without going into further detail, it may be said that his inductive method became the basis of science for the next 300 years. He has to be regarded as one of the most important pioneers of modern science, although not entirely original.

Some words have to be said about the famous Shakespeare-Bacon controversy which began in the middle of the 19th century. An American school teacher, Miss Delia Bacon, and an English solicitor, William Henry Smith, became skeptical about Shakespeare's authorship of his plays. They believed that since Bacon was by all accounts the most learned man of his time, it was more probable that he wrote the plays than a "half-educated villager," especially since no manuscripts of Shakespeare's works nor any documentary records of his writing or publishing them have been found. Literary research has almost completely disproven this theory.

FRANCIS BACON

Bacon, JOSEPHINE DODGE DASKAM, author, born in Stamford, Conn., Feb. 17, 1876; died in Tannersville, N.Y., July 30, 1961. She was graduated from Smith Coll. in 1898 and five years later married Sheldon Bacon. Her writings consist largely of fiction and short poems. Among her books are "Smith College Stories" (1900), "The Imp and the Angel" (1901), "The Madness of Philip" (1902), "Whom the Gods Destroyed" (1902), "Open Market" (1915), "Kathy" (1933), and "The Root and the Flower" (1939).

Bacon, LEONARD, clergyman, born in Detroit, Mich., Feb. 19, 1802; died Dec. 24, 1881. In 1820 he was graduated from Yale, and in 1825 became pastor of the First Congregational Church of New Haven. From 1866 until 1871 he was professor of theology at Yale. He contributed many excellent articles to the *New Englander* and the *Christian Spectator*, and established the New York *Independent* in 1847. His son, Leonard Woolsey Bacon, was born in New Haven, Conn., Jan. 1, 1830; died 1907. He studied at Yale and Andover, served as pastor in New York, and subsequently held charges in other cities. From 1872 to 1877 he studied in Europe, much of the time in Geneva, and after his return to America preached the gospel, wrote church hymns, and published numerous works on religion. His writings include: "Sunday Observance and Sunday Law," "The Vatican Council," and "The Simplicity That is in Christ."

Bacon, LEONARD, poet and critic, born in Solvay, N.Y., May 26, 1887; died in South Kingston, R.I., Jan. 1, 1954. His great-aunt, Delia Bacon, originated the controversial theory that Francis Bacon was the author of Shakespeare's plays. Leonard Bacon received his B.A. from Yale Univ. in 1909 and the next year began instructing in English at the Univ. of California, leaving that institution as professor of English in 1923 to devote his full time to writing poetry and literary criticism. He received the Pulitzer Prize for poetry for "Sunderland Capture and Other Poems" (1941). Among his works are: "Ulug Beg" (1923), "Legend of Quincibald" (1928), "Lost Buffalo" (1930), "Rhyme and Punishment" (1936), "Bullinger Bound" (1938), "Semi-Centennial" (1939), and "Days of Fire" (1943).

LEONARD BACON

Bacon, NATHANIEL, colonial leader, born in Suffolk, England, Jan. 2, 1647; died in Virginia, Oct. 29, 1676. In 1670 he came to America joining the Virginia settlement. He practiced law for some years, became a member of the governor's council and played a prominent part in the early history of Virginia. In 1676 he put down an Indian uprising, and soon after became complicated with Governor Berkeley, who had restricted the franchise and instituted high taxation. He made an attack upon Jamestown, in which he was aided by many of the people, and compelled Berkeley to grant reforms. This is known in history as Bacon's Rebellion, and the laws dictated by him are described as Bacon's Laws. His premature death was followed by a repeal of the latter, and Governor Berkeley caused some of the prominent participants to be executed for their activity in the affair.

Bacon, PEGGY, artist and author, born Ridgefield, Conn., May 2, 1895. She received a diploma from Kent Place School, Summit, N.J., then attended the Art Students League and the School of Fine and Applied Arts, New York City, where she studied various media under Jonas Lie, John Sloan, George Bellows, and George Bridgman. Her etchings, pastels, ink drawings, etc., are shown in the important American galleries. She has written and illustrated a number of books and poems, and the *New Yorker* and other well-known magazines have published her work.

Bacon, ROGER, philosopher and scientist, born in Ilchester, England, *ca.* 1214; died *ca.* 1294. He studied at Oxford and in Paris where he received the degree of Doctor of Theology, later returning to Oxford to teach. After a time he took the vows of the Franciscan order and pursued his scientific studies, at the same time teaching what today would be called "moral theology." He had many pupils and became well known. Soon his contemporaries began to call him *doctor mirabilis* because of his unusual universality. He was equally capable in the fields of geography, astronomy, astrology, chemistry in the then usual form of alchemy, physics and mathematics. He even corrected the Julian calendar. Bacon was one of the first to try to gain a universality in natural science. His "Opus Majus" represents an aston-

Courtesy Brown Bros., N. Y.

ROGER BACON

RCA Photo

BACILLUS TUBERCULOSIS MAGNIFIED 42,000 TIMES

ishing, all-comprehensive encyclopedia of what was known in his time concerning natural science, enriched by many augmentations and corrections of his own. His historical merit lies not only in the progress he achieved in the various fields of natural science but in his special gift for systematization of the knowledge of the time.

Bacon was also interested in problems of theology and ethics. Out of his better knowledge and clearer thinking, he began to protest against certain theological attitudes and against the form of life he found among the clergy. So, a bitter fight against him began, and even the forwarding of his "Opus Majus" to Pope Clement (1267) did not help him very much. Vital interests of large groups were so attacked that they denounced him and finally brought about his imprisonment. He remained in prison for 14 years and although records are not altogether complete as to this period, it is believed that he was freed shortly before his death, *ca.* 1294.

For the history of theology as well as of science, Bacon's importance lies in his fight against scholasticism, especially against some hair-splitting theological deductions which were then prevalent in theology and philosophy. Bacon emphasized a return to nature and to antiquity, stressing the value of practical experimentation on the one hand, and of the studies of ancient languages on the other. Thus, he may be considered in some respects the predecessor of the later Humanists (*q.v.*). He fought for a change in theological education, calling for a more thorough grounding in scientific research. The fight for his scientific ideas, however, was not as dangerous for him as his endeavors to elevate the moral level of the clergy.

In spite of his "progressive" attitude as compared with that of his contemporaries, it would be a mistake to consider Bacon as a forerunner of modern "materialism" (*q.v.*) or "pragmatism" (*q.v.*). Notwithstanding all his endeavors for intellectual and moral improvement of his time, he always remained a true believer and son of his church. In this light it is correct to compare him with the other great scholars of the 13th century, Albertus Magnus and Thomas Aquinas.

Bacon-Shakespeare Controversy. See *Bacon, Francis; Shakespeare, William.*

Bacon's Rebellion. See *Bacon, Nathaniel.*

Bacteriology (*băk-tē-rĭ-ŏl′ō-jȳ*), the study of certain microscopic forms of life, classed as *Schizomycetes* or fission-fungi because of the manner in which they multiply by transverse fission and because the sum total of their characteristics allies them more closely to plants than to animals. Among the plant forms, they are classed under *Thallophyta,* plants without distribution of root, stem, or branch, grouped as follows:

1) Algae;
2) Thallophytes, lacking in chlorophyl;
    Class I Schizomycetes, bacteria
    Class II Saccharomycetes, yeasts
    Class III Phycomycetes, algaelike forms
    Class IV Ascomycetes, aspergilli
    Class V Basidiomycetes

Bacteria are found in air, soil, water, and in the saliva and intestinal contents of man and animals. Pathogenic or disease-producing bacteria are the cause of specific infectious diseases of man, animals, and certain plants.

Morphology. Bacteria vary in size from fractions of a micron to several microns in length and diameter. The bacillus of influenza is just on the border of visibility under an optical microscope (0.2 micron wide by 0.5 micron long) while the bacillus of typhoid fever is of average size, 0.5 x 2.4 microns (a micron is 1/1000th of a millimeter). They are comparatively structureless; nuclei or chromosomes have not been found. Some are motile by means of numerous whiplike flagella, as typhoid bacillus and cholera vibrio. Others move by undulations of a corkscrew-shaped body, as the bacteria of syphilis and relapsing fever. Staining of fixed specimens with aniline dyes is an aid to study and identification. The tubercle bacillus is difficult to stain but once stained resists decolorization with acid. This property is used to identify it in sputum, tissues, and cultures. The dye used is fuchsin. Carbolic acid (phenol) is added, and heat used to make the organism take the stain. After staining, the preparation is decolorized in 2 per cent hydrochloric acid, which decolorizes other micro-organisms, cells, or tissue elements, but leaves the bacillus of tuberculosis bright red. The pus-forming organisms, staphylococcus, streptococcus, and pneumococcus are stained a deep blue by the Gram treatment, in which gentian violet is the dye, Lugol's solution of iodine in aqueous potassium iodide acts as mordant, and anhydrous alcohol is the decolorizing agent. The majority of other bacteria are decolorized by the anhydrous alcohol. The root word for bacteriology, bacterium, means a rod, but the class of bacteria includes spheroidal forms or cocci; bent forms or vibrio; and spiral forms or spirochetes.

The rate of multiplication of bacteria is exponential, but so is the death rate. The geometrical ratio of increase is not limited to bacteria, but also occurs with animal cells.

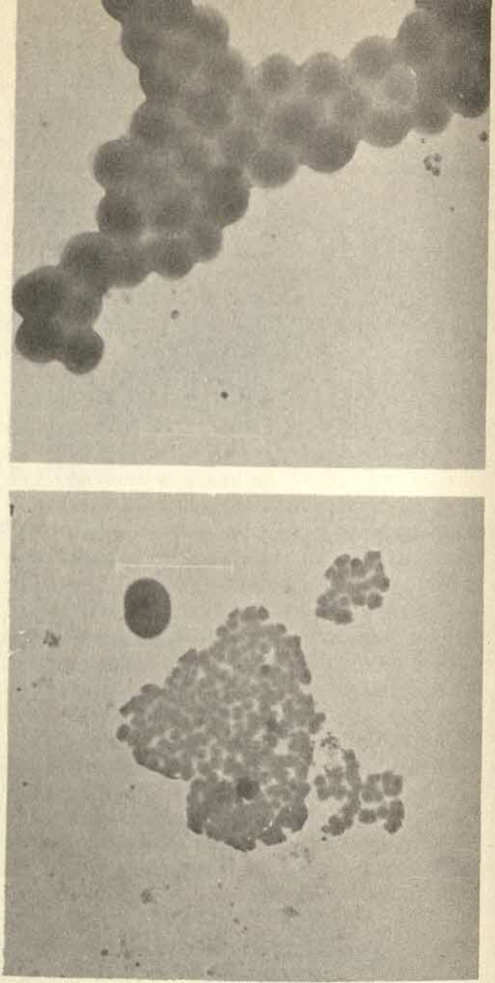
In nature, bacteria serve to convert proteins, by breaking up or decomposing dead animals, plants, and wastes, into ammonia and nitrates which are in turn converted by plants into living proteins which again serve as food for living animals. Nitrogen-fixing bacteria absorb nitrogen from the air and produce nitrates. They live in association with the leguminous plants, which the farmer utilizes when he grows clover on poor soil and plows it under for fertilizer. Iron deposits are also the result of bacterial action.

Other varieties of bacteria cause milk to sour, wine and cider to turn into vinegar, corn mash to produce acetone and alcohol. Bacteria are also used to cure hides and tan leather; to ret hemp and flax for the production of textile fibers, and in the tobacco, coffee, tea, and cocoa industries to digest the covering of seeds or to cure leaves.

Many bacteria are harmful in that they produce diseases such as typhoid, diphtheria, tuberculosis, cholera, pneumonia, measles, cerebrospinal meningitis, tetanus, and the pus-forming abscesses. The decomposition products of bacteria, rather than the bacteria themselves, may be the cause of some diseases. Other diseases are produced by bacteria which invade the tissues and destroy them. The bacillus botulinus may occur in the canning of foods, when insufficient temperature is used, and may cause fatal poisoning. Similarly, other bacteria may produce ptomaines, which are highly poisonous. In food canning, all bacteria should be destroyed by heating the food under pressure for 15 minutes at 115°C. (239°F.) making sure that this heat reaches the center of the container.

Disease-causing bacteria produce toxins, which are complex proteins. These act upon the body and cause symptoms of the disease. To combat the toxins, the living body produces antitoxins, which overcome the poisonous effects of the toxins and permit the bacteria to be destroyed by the white blood cells. The biochemists take advantage of the value of the antitoxins by producing large quantities of them for use in medicine. This is accomplished by injecting the specific toxin into animals, such as the horse, and then preparing the antitoxin from the blood of the animal. These antitoxins are used to treat persons who have already developed the specific disease.

Immunity against certain bacterial diseases may be conferred by injecting into a healthy person a culture of the dead or attenuated bacteria which cause the disease. The antitoxin for that disease is then produced within the healthy person's body and he is prevented from contracting the disease at some future time. These cultures of dead or attenuated bacteria are known as "vaccines." See also *Inoculation; Vaccination.*



RCA Photo

BACTERIA STAPHYLOCOCCUS AUREUS

Before penicillin is introduced *(top)*
After penicillin is introduced *(bottom)*

One of the molds, *penicillium notatum,* excretes a substance, known as penicillin, which kills bacteria, but is non-toxic to humans. It and other antibiotics are of great value in the treatment of diseases caused by bacteria.

Other micro-organisms (also commonly called germs or microbes) may be divided into the classifications of yeasts, molds, protozoa, and viruses. *Yeasts* are microscopic plants which multiply by the formation of buds. *Molds* are multicellular plants composed of threads or mycelia, classified according to their arrangement of reproductive organs into three groups, penicillium, mucor, and aspergillus. *Protozoa* are minute organisms which are essentially animal in their nature. Recently the work of biochemists has indicated the existence of bodies which are smaller than any known micro-organisms, yet in the presence of living bodies have the capacity for multiplication. These are known as *viruses,* some of which feed upon living bacteria and are therefore called bacteriophages.

Germicidal (electric) lamps, provided with special glass which transmits rays of 2537 Angstrom units from the ultraviolet portion of the spectrum, may be used to kill bacteria and other micro-organisms upon sufficient exposure. These lamps are particularly applicable to commercial installations for use in eliminating molds, bacterias, in meat curing; in the bottling industry; in canneries; in the packaging industry; in the pharmaceutical field, etc. Properly protected (for ultraviolet light is damaging to animal and human cells), these lamps may be used in public places, schools, theaters, to reduce the bacterial count of the air.

Antibiotics are chemical substances secreted by micro-organisms, principally fungi and bacteria, which are capable of inhibiting the metabolic activities, growth, or reproduction of bacteria.

Thirty or more antibiotics are now known, among them aureomycin, penicillin, and streptomycin (*qq.v.*). They are important in water and sewage purification. Their value to medicine lies in the fact that some of them control diseases without harming diseased tissue of the body. Along with the sulfonamides they provide treatment of wound infection, blood poisoning, pneumonia, meningitis, sore throat, venereal diseases, and others, though not for tuberculosis or virus diseases. See also *Virus.*

Bacteriology as a study had its beginning in 1675 when, by the use of the microscope, important discoveries were made by Anthony Leeuwenhoek (1632-1723), a native of Delft, Holland. However, it was not fully established as a science until 1881, when Robert Koch (*q.v.*) gave the world his reports of *bacillus tuberculosis,* the causal agent in the disease of tuberculosis. See also *Aureomycin; Penicillin; Streptomycin; Virus.*

Bactria (*băk'trĭ-ȧ*), or BACTRIANA, the name of an ancient country of Asia, located between the Amu or Oxus River and the Hindu-Kush Mts. It is supposed to have been identical with the modern province of Balkh, and is considered the native country of the Indo-European peoples. In the 3rd century B.C. Bactria was a powerful kingdom, and was ruled by a dynasty of Greek origin. Buddhism obtained a strong foothold at the beginning of the Christian era. Later, Bactria became subject to Bokhara and with it passed under the dominion of Russia in 1868.

Badajoz (*bä-THä-hōth'*), a town in Spain, capital of a province of the same name, on the Guadiana River. It is near the boundary of Portugal, 130 m. E. of Lisbon, with which it is connected by railway. An old cathedral, a Moorish castle, and several monasteries are among its buildings. The manufactures consist chiefly of delftware, woolens, and leather goods. Wellington captured it in 1812. Population, *ca,* 40,000.

Baden (*bä'dẹn*), a watering place in Austria, 15 m. s.w. of Vienna. It is noted for the warm sulphur springs in its vicinity, whose temperature ranges from 72° to 97°. The town has a number of fine buildings and fashionable hotels, and near it is the royal hunting lodge known as Mayerling. The springs were known in the time of the Romans and a number of coins and antiquities of Roman origin have been found in the vicinity. Population, *ca.* 25,000.

Baden-Baden, or BADEN, a city of Germany, in the former duchy of Baden, famous as a resort. It is situated 18 m. s.w. from Karlsruhe, on the hills of the Black Forest. Near it are some of the most noted and healthful thermal baths in Europe. These cause it to be visited by many thousands annually. The city is well known in history, having been founded by the Roman Hadrian in the 2nd century, when it was known as *Civitas Aurelia Aquensis* (watering-place of Aurelius). Its springs were famous throughout the Middle Ages, and long attracted all classes who were in search of pleasure or health. The springs have a temperature of from 100° to 150°, and discharge about 4,500 cu. ft. of water daily. It is applied medicinally in cases of gout, skin diseases, rheumatism, and other ailments. The city has beautiful promenades and gardens, and the highways are ornamented with flowers and foliage. From the heights near the city may be seen the waters of the Rhine. The headquarters of the French Army of Occupation are in Baden-Baden.

Baden, a state in the southwestern part of Germany. It is bounded on the N. by Bavaria and Hesse-Darmstadt, E. by Württemberg and Bavaria, S. by Switzerland, and W. by Rhenish Bavaria, Alsace, and Lorraine. Toward the south of it flows the Rhine. It contains the Black Forest, or Schwarzwald, on the highlands of the southern part, and its northern portion is a plain. The drainage is to the North Sea by the Rhine, and to the Black Sea by the Danube. The soil is fertile, especially along the Rhine valley. Its highlands abound in valuable minerals, including iron, zinc, coal, nickel, salt, and limestone. Mineral and thermal springs are abundant in the region.

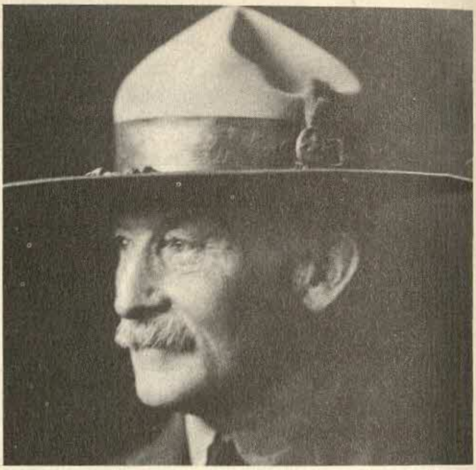
Two universities are maintained at Freiburg and Heidelberg, and a modern public school system is maintained. The state has extensive railroad lines, well-built highways, many manufacturing cities, and large vineyards. The manufactures consist of woolen and silk goods, beet sugar, musical instruments, machinery, wine, soap, and earthenware. Large interests are vested in the manufacture of clocks, employing about 12,000 people. Karlsruhe and Mannheim are the chief commercial centers.

In early history Baden was inhabited by savage tribes classed with the Alemanni, who were subdued by the Romans under Hadrian. Baden was ruled by the House of Zähringen from 1112-1918. In 1815 Charles Ludwig joined the German Confederation, in which Baden held the seventh rank. In 1866 it sided with Austria against Prussia, but was united soon after with the North German States. When the Franco-Prussian War broke out, in 1870, Baden took an active part against France, and became part of the German Empire in 1871. After World War II, Baden was occupied by American forces and for administrative reasons combined with Württemberg (*q.v.*). Most of the country was handed over later by the Americans to the French to be incorporated into the French zone of occupation. Area, 15,720 sq. m.; population, in 1939, 2,518,103.

Baden-Powell (*bä'dẹn-pō'ẹl*), SIR GEORGE SMYTH, author and diplomat, born at Oxford, England, Dec. 24, 1857; died Nov. 20, 1898. He was educated at Balliol Coll., Oxford, traveled extensively in New Zealand and Australia, and contributed to various periodicals, among them the London *Times*. In 1887 he became private secretary to the governor of Victoria, traveled in the West Indies, 1880-81, and in 1885 was elected to Parliament as a Conservative. The following year he was sent to Canada to draw up reports on the fisheries question, the issues of which were settled in 1891. He was knighted for his services to the public in publishing reports on the West Indies. His numerous writings include: "Protection and Bad Times," "Truth about Home Rule," and "State Aid and State Interference."

Baden-Powell of Gilwell, FIRST BARON, ROBERT STEPHENSON SMYTH, soldier and founder of the Boy Scout and Girl Guide movements, born in England, 1857; died in 1941. Educated at Charterhouse, London, he later saw active duty in India and Africa, notably in the gallant defense of Mafeking (1899-1900) in the South African War. He organized the South African Constabulary, and in 1910, a lieutenant general, he retired from active service. However, he worked with the British Intelligence Department during World War I.

In 1908 he founded the Boy Scouts and the Girl Guides, youth organizations that have since taken on international proportions. For this contribution he received a peerage. In addition to directing the above groups, he exhibited sculpture and paintings in the Royal Acad., London, and wrote on sports and scouting.



Courtesy Boy Scouts of America

BADEN-POWELL OF GILWELL

Badge (*bǎj*), a mark, sign, or token worn on the dress to show the relation of the wearer to the government, or to some society or organization. It is either conferred by the state or assumed by the individual for the purpose of distinction. The garter of the English knight was conferred by public authority, so also were the golden fleece of the Spanish grandee and the button of the Chinese mandarin. Societies, as lodges, clubs, and civic societies, confer badges as marks of distinction. Many conventions, notably those of political parties, authorize badges as a symbol to distinguish delegates claiming seats; and workers in industry frequently wear badges of identification.

Badger (*bǎj'ẽr*), a quadruped mammal common to America and Eurasia. It is clumsy and awkward in its movements. The legs are thick and short and the feet are straight, while the forefeet are armed with long claws. Among the typical species are the American, the European, and the balisaur, or sand badger, of India. The American badger is grizzled-gray with one or more white stripes on the face. It is about 2 ft. long, including the tail, which is short. It burrows in the ground and spends the days in sleeping, but comes out at night to feed upon roots, small animals, and insects. Its fur is a valuable article of commerce and its flesh is eaten. This animal was once very abundant in Wisconsin, hence its popular name—Badger State. The European badger resembles the American in size and color, but the balisaur is larger and resembles a small bear.

Bad Lands (*bǎd lǎndz*), a region of North America, situated principally in the upper drainage basin of the Missouri River. The section of country designated as bad lands is made up largely of sand and gravel, with here and there rocks and irregular horizontal strata of clay and limestone, and is peculiarly destitute of vegetation. The rainfall is scant, and though small grasses occur in some sections, in others the vegetation consists largely of sagebrush. Medora, N.D., is

Courtesy Nebraska Game & Parks Comm.

BAD LANDS OF WESTERN NEBRASKA

surrounded by bad lands, and from that point they extend north and south. Large tracts that may be classed as bad lands occur in the vicinity of the Black Hills, and in Texas, New Mexico, Arizona, Nebraska, and Colorado.

Badminton (*băd′mĭn-tŭn*), a racket game similar to tennis, deriving its name from Badminton House, seat of the Duke of Beaufort, in Gloucestershire, England, where it was first played (1874) by a group of British army officers who had become acquainted with a version of the game in India. It may be played by either two (single game) or four (doubles game) players and consists of volleying with a light racket, weighing 4 to 5 oz. and similar to a tennis racket, and a feathered shuttle or bird across a net 5 ft. high. For the single game the court is 44 ft. by 17 ft.; for doubles the court is widened to 20 ft. The doubles and men's singles games consist of 15 or 21 points. The ladies' singles game consists of 11 points. In official competition the doubles and men's singles games are 15 points.

Organized badminton is played in more than 15 countries which hold membership in the International Badminton Federation with headquarters in London, England. In the U.S. the national organization is the American Badminton Assn., with 270 member clubs. In addition to these organizations, badminton is played in Y.M.C.A.'s, colleges, high schools, athletic clubs, and on private grounds in all sections of the U.S. National championship matches are held annually.

Badoglio (*bä-dō′lyō*), PIETRO, soldier, statesman, born in Grazzano Monferrato, Italy, Sept. 28, 1871; died in Grazzano, Oct. 31, 1956. An army officer, he served in many 19th-century Italian campaigns and in World War I, advancing to the rank of marshal in 1926. He was chief of staff (1919-21, 1925-28, and 1933-40), ambassador to Brazil (1924), and governor general of Libya (1928-33). Although known for his anti-Fascist attitude, he commanded the Italian forces in Ethiopia (1935-36) and in World War II during the early part of Italy's invasion of Greece. He was created marquis of Sabotino in 1928 and duke of Addis Abbaba in 1936. As premier (1943-44), after the ouster of Mussolini (*q.v.*), Badoglio effected the surrender of Italy to the Allies (Sept. 8, 1943), hoping to align his country with the Western democracies.

Baekeland (*bā̆′kẹ-lănd*), LEO HENDRIK, chemist and inventor, born in Ghent, Belgium, 1863; died in 1944. After graduating from Ghent Univ., he migrated to the U.S. in 1889. His greatest chemical achievement was the discovery of the synthetic resin now named bakelite (*q.v.*) in his honor. Products of bakelite formed the nucleus of the now-flourishing plastics (*q.v.*) industry.

Baeyer (*bā̆′ē̆r*), JOHANN FRIEDRICH WILHELM ADOLF VON, chemist, born in Berlin, Germany, Oct. 31, 1835; died Aug. 20, 1917. He began teaching in Berlin in 1860; in 1875 he became professor of chemistry at the Univ. of Munich. His research centered on organic chemistry and he became known for his work on the benzol theory, the uric-acid group, and his "theory of tensions." Probably most famous of his contributions were his discoveries of the phthaleine class of dyes, especially the syntheses of indole, eosine, and indigo, the latter of which was first produced artificially by him in 1870. In 1905, he received the Nobel Prize for his research on organic dyes and aromatic hydro-carbon compounds.

Courtesy N. Y. Academy of Medicine

ADOLF VON BAEYER

Baffin (*băf'fin*), WILLIAM, navigator, born in London, England, in 1584; died May 23, 1622. He accompanied James Hall in 1612 on an Arctic expedition, and in 1616 discovered Baffin's Bay. He wrote an account of his travels and explorations and prepared maps and tables of the regions in the Arctic visited by him. In 1622 he took part in an expedition against the Portuguese and was killed at the siege of Ormuz, in the Persian Gulf. Baffin was the first to leave a record of the determination of longitude at sea by lunar observations.

Baffin Bay, a body of water off northeastern Canada, between Baffin and Ellesmere islands and Greenland. About 800 m. long, it has an average breadth of 280 m. and a depth of about 7,000 ft. It is connected with the Atlantic Ocean by Davis Strait, and with the Arctic Ocean by Lancaster and Smith Sounds. Through it pass currents to the south, but at least one is known to move northward around Cape Farewell. The tide waters rise about 10 ft. Its shores are steep and lofty, and are inhabited by fur-bearing animals common to the northern climates, and thousands of gulls and sea-fowls. It was discovered in 1616 by William Baffin, after whom it was named. It is navigable only four months in the summer, owing to its waters being frozen. The bay is valuable for whale fishing, and the adjacent region is rich in minerals.

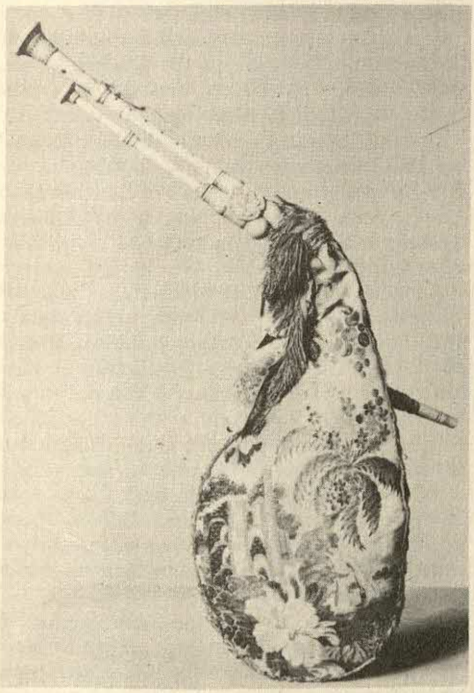
Baffin Island, formerly known as BAFFIN LAND, the largest island of the Arctic Archipelago, a part of Franklin District, Northwest Territories, Canada. Most of the mountainous island, *ca.* 1,000 m. long and *ca.* 200 to 500 m. wide, lies within the Arctic Circle and has a severe climate. Its population, mostly Eskimo, is *ca.* 2,000.

Bagatelle (*băg-ạ-tĕl'*), a game played on a cushion-rimmed table with a cue and spherical balls. It resembles billiards. The table is about 7 ft. long and 3 ft. wide. Nine cups or sockets large enough to receive the balls are at the end, and the game consists of driving the balls into the openings. The game is probably of English origin, although the name is French. The French form of the game is called *"Sans Egal,"* which means "Without Equal."

Bagdad (*băg-dȧd*), or BAGHDAD, the capital of Iraq. It is situated on the banks of the Tigris River, which is crossed by several pontoon bridges. The city is surrounded by a wall 40 ft. high, with four gates. It was founded about 762 A.D., and built of material taken from the ruins of Seleucia. Among the chief buildings are the citadel, the governor general's palace, and many mosques. Bagdad was enlarged in the 9th century by Harun-al-Rashid, who built a palace for himself, and a tomb for his favorite wife, Zobeide. He erected numerous edifices and bridges. In the 10th century it was ravaged by the Turks, and in the 14th century by Timur. Subsequently it passed over to Persia, and then back to the Turks, who had it under their sway after the 18th century. The inhabitants engage largely in trade and produce a variety of manufactures, such as silk, carpets, drugs, and ornaments. They consist chiefly of Turks, Arabs, Jews, Hindus, Afghans, Persians, and Armenians. The city is important on account of its location on the Tigris, which affords a highway for navigation to the sea and many interior points. It forms the principal telegraphic connection between Western Asia and British India. Its manufactures are developing under European stimuli, and it is the seat of a large trade. The British, under Gen. Maude, captured it in 1917. Population, 1922, 232,675; in 1937, 256,564.

Bagehot (*băj'ŭt*), WALTER, economist and publisher, born in Langport, England, Feb. 3, 1826; died Mar. 24, 1877. He studied at the University Coll., London, where he won distinction in philosophy and political economy. In 1848 he was admitted to the bar, but instead of practicing that profession he went into the banking business with his father. He contributed to several periodicals, including *The Economist,* a free-trade organ, and was regarded as an authority on finance and banking. His chief publications are: "Estimates of Some Englishmen and Scotchmen," "The English Constitution," "Lombard Street," and "Physics and Politics."

Bagpipe (*băg'pīp*), a musical instrument of unknown antiquity. Up to the 18th century it was used in all the countries of Eurasia, and it is still popular in Scotland, France, Spain, Italy, and many countries of Asia. It consists of a leather bag, generally covered with cloth, which rests under the arm of the musician and to which three or four pipes, the "blow-pipe," the "chanter," and the "drones," are connected. The player inflates the bag by blowing through the "blow-pipe." The "chanter," at the opposite end of the bag from the "blow-pipe," contains finger holes which serve in playing the tune. The "drones" point over the shoulder and sound a continuous low note.



Courtesy The Metropolitan Museum of Art, N. Y.

BAGPIPE, FRENCH, 18TH CENT.

Bag covered with silk tapestry, bordered with gold and silver lace

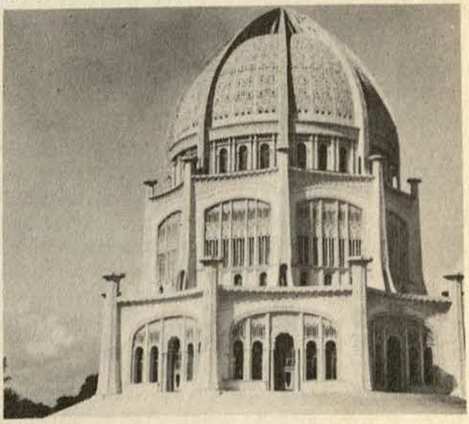
Bahaism (*bạ-hä'iz'm*) a faith founded in Persia, 1863, by Mirza Husayn Ali or Hussein Ali (1817-92), known as Bahá'u'llah ("the glory of God"), having as its essential aim the unification of mankind into a universal faith and single world society. The world era of conscious knowledge and social responsibility is dated from May 23, 1844, and subsequent wars and upheavals are explained as painful adjustments of the old order resisting the inevitable triumph of the new. The Bahais declare that civilization decays when materialism replaces faith, and is reborn when the spirit is renewed. Bahaism has no professional clergy, holding that spiritual knowledge is expressed in daily life. The faith glorifies knowledge, useful trades, the arts and professions, teaching that economic and other social problems can be solved by cooperation and fellowship in and under constitutional world government. Adherents to Bahaism are found in many countries; the center of activities in the U.S. is at Wilmette, Ill. See also *Babism*.

Bahamas (*bạ-hä'mạs*), a group of islands in the West Indies, nearly 600 m. long, southeast of the coast of Florida. The total area is 4,404 sq. m. The group includes nearly 700 islets and islands and over 2,000 coral reefs. Among the principal islands are Andros, New Providence (containing the capital, Nassau; pop., 1953, 46,125), Grand Bahama, Great and Little Abaco, Crooked, Great Exuma, San Salvador or Watling, Great Inagua, Long, and Harbor. About 20 of the islands are inhabited. The leading products include tomatoes, lumber, sisal, and a variety of fruits. Steamship and air services are maintained among the islands and with U.S. and European cities. Many of the islands are noted for their fine climate and are visited by thousands of tourists every year.

The history of the Bahamas dates from Oct. 12, 1492, when Columbus discovered them, the first land viewed by him in America. The islands were fought over by the Spanish and the English, who installed their first governor in 1718. American loyalists settled there after the Revolutionary War; and during the American Civil War the Bahamas were used by Confederate blockade runners.

The islands now form a British colony; and the government is administered by an executive council, a legislative council, and a representative assembly under the direction of a governor appointed by the queen of England. The duke of Windsor (see *Edward VIII*) held the governorship, 1940-45. Also in 1940, the U.S. was granted a 99-year lease for defense installations on the islands.

Population, 1959, 103,955 (with 80 per cent native inhabitants).



BAHAI HOUSE OF WORSHIP

The edifice, a nine-sided structure at Wilmette, Ill., rises from a circular base surrounded by steps and is surmounted by a great dome

Courtesy Journalist

BAHIA

The Lacerda elevator connects the upper and lower levels of Bahia, Brazil

Bahia (*bä-ē'ä*), or SÃO SALVADOR, the second city of Brazil, on the Bay of All Saints, and capital of the State of Bahia. It has one of the most commodious harbors in the world. It is the seat of a university, an arsenal, and the palace of an archbishop. It has railroad connection with the interior, and submerged telegraphic communication with Europe. Intercommunication is provided by an extensive system of electric railways, with which suburban and interurban lines are connected. The manufactures include leather, tobacco, sugar, clothing, lumber products, and machinery. It has a large export trade in cotton, sugar, rice, live-stock, minerals, and fruits. Bahia was founded in 1549 and was the capital of Brazil until 1763. Population, *ca.* 400,000.

Bahia Honda (*bä-ē'ä ōn'dä*), a seaport of Cuba, in Pinar del Río province, *ca.* 56 m. w. of Havana. The harbor, *ca.* 2 m. distant, is one of the best in Cuba. It is 5 m. long by 3 m. wide, with an average depth of 28 ft. The surrounding country produces sugar-cane and has copper and coal mines. Population, *ca.* 1,750.

Bahr (*bär*), HERMANN, author and journalist, born at Linz, Austria, in 1863. After securing a liberal education by attending universities at Vienna, Gratz, and Berlin, he traveled extensively and returned to Vienna, where he made his permanent residence. He became associate editor of the *Free Stage* in 1890 and subsequently was editor and critic of several periodicals. In 1894 he founded *The Times*, in which enterprise he became known as an acute critic and a skillful writer. The numerous books published by him include: "New Studies," "Critic of the Modern," "The Good School," "The Newer Mankind," and "The Home-like Wife." He died in 1934.

Bahrein Islands (*bä'rān*), an archipelago in the Persian Gulf, 20 m. E. of al Hasa on the Arabian coast, forming the state of the same name (under British protection since 1861). Bahrein, the largest island, is 27 m. long and 10 m. wide; other islands are Muharraq (in the N.E.), and several smaller islets some of which are uninhabited. The principal cities are Muharraq (pop., 18,000), and Manama, the capital (pop., 28,000), on Bahrein Island. Manama has a good harbor, a wireless station, and several schools. The majority of the population is Arabian.

Bahrein is the center of the pearl-fishing industry of the Persian Gulf region. Agriculturally it is of small importance, although dates, citrus fruits, and lucerne are cultivated. Oil was discovered in 1932, and about 50,000,000 tons are produced annually. The total population of the islands is 120,000.

Baiae (*bī'ē*), or BAJA, an ancient town of Italy, located on a bay in Campania, 10 m. W. of Naples. In the time of the Romans it was popular as a watering place and contained the villas of many wealthy citizens, who were fond of its pleasant climate and warm mineral springs. The society of Baiae was noted for its luxury and dissoluteness. Many ruins of Roman baths and temples are on the site of the town.

Baikal (*bī-käl'*), a large fresh water lake in Siberia, near the Chinese frontier, about 400 m. long and from 20 to 50 m. wide; area, 14,000 sq. m. The greatest depth is 4,500 ft. It is located among great mountain peaks, which yield valuable minerals. In the summer season large vessels sail upon it, and in winter it is crossed on the ice. Salmon, pike, sturgeon, and seals abound. Immediately south of the southern shore passes the great Trans-Siberian Ry. from Leningrad to Vladivostok, and on its southwestern coast is the city of Irkutsk, the seat of a government of the same name. The Angara River, a tributary of the Yenisei, is the outlet of Lake Baikal.

Bailey (*bā'lĭ*), JAMES MONTGOMERY, journalist, born in Albany, N.Y., Sept. 25, 1841; died Mar. 4, 1894. He worked at the trade of a carpenter for some time, served as a volunteer in the Civil War, and in 1870 established the *Danbury News*, in which he published many humorous sketches and made his paper known throughout the country. In 1873 he published "Life in Danbury," which consisted chiefly of articles selected from his newspaper. Other books of his are "England from a Back Window," "Mr. Phillips's Goneness," and "The Danbury News Man's Almanac."

Bailey, JOSEPH, soldier, born in Salem, Ohio, Apr. 28, 1827; killed in Missouri, Mar. 21, 1867. He entered the U.S. army as a private in 1861, and in 1864 built a dam and deepened the channel waters of the Red River above Alexandria in Louisiana so the Mississippi flotilla could pass over the rapids. Congress extended him a vote of thanks and made him brigadier general. He was killed while sheriff of Newton County, Missouri, by a desperado.

Bailey, JOSEPH WELDON, U.S. Senator, born in Copiah County, Miss., Oct. 6, 1863; died in Sherman, Texas, Apr. 13, 1929. He studied law and entered politics. In 1884 he was elected a Presidential elector on the Democratic ticket, and the following year removed to Gainesville, Tex., where he practiced law. In 1890 he was elected to Congress, serving continuously until 1901, when he was elected to the U.S. Senate for a full term, and was re-elected in 1907. In 1913 he resigned from the Senate and resumed the practice of law.

Bailey, JOSIAH WILLIAM, U.S. Senator, born in Warrenton, N.C., Sept. 14, 1873; died in Raleigh, Dec. 15, 1946. He graduated from Wake Forest Coll., N.C. (1893), and received an LL.D. (1931). He studied law, served as editor of the *Biblical Recorder*, N.C. Baptist official organ (1893-1907), and was admitted to the bar in 1908. In 1913 he became a member of the State Constitutional Commission, and U.S. Collector of Internal Revenue in N.C., a post which he held until 1921. Following the rebellion against party dictatorship in Democratic N.C. which marked the beginning of his political ascendancy, he campaigned in support of the Democratic Presidential ticket in 1928. He was elected to the U.S. Senate for three consecutive terms beginning in 1931. His senatorial activities included leading a filibuster against an anti-lynching bill (1938), an abrupt change from isolationism to a strong interventionist position (1941), and initiation of some significant wartime legislation.

Bailey, LIBERTY HYDE, botanist and horticulturist, born in South Haven, Mich., March 15, 1858; died in Ithaca, N.Y., Dec. 25, 1954. A graduate (1882) of Michigan State Agricultural Coll., he was assistant (1882-83) to botanist Asa Gray (*q.v.*) at Harvard Univ. He returned to Michigan in 1885 as a professor and organized the first college department of horticulture and landscape gardening in the U.S. Called to Cornell Univ. in 1888 to teach general and experimental horticulture, Bailey added new horticultural and botanical departments and introduced new ideas in scientific education, particularly extension courses for farmers. His interest in rural problems and in education often led him to go directly to farmers in rural districts to bring them information on new methods. In 1890 he organized Cornell's Coll. of Agriculture, becoming the dean and director when it became a state college in 1903. President Theodore Roosevelt made him chairman of his Commission on Country Life concerned with rural problems (1908). Bailey retired from teaching in 1913 to work on his collection of plants (the Liberty Hyde Bailey Hortorium, given to Cornell in 1935) as well as to write and edit. The author of some 50 books as well as the editor of a number of standard works in the field, he made many trips throughout the world to collect plant specimens and information. For his contributions to horticulture and botany he was awarded several medals and honorary degrees.

Bailey, PHILIP JAMES, poet, born at Nottingham, England, Apr. 22, 1816; died there, Sept. 6, 1902. He studied at Glasgow Univ., was admitted to the bar at London, and in 1839 published his most popular poem, entitled "Festus." His later publications include "The Mystic," "The Angel World," and "The Universal Hymn."

Baily, FRANCIS, astronomer, born at Newbury, Berkshire, England, April 28, 1774; died in London, Aug. 30, 1844. He entered the London Stock Exchange in 1799 and published several studies of annuities. Retiring from business in 1825 with a fortune, he devoted himself to astronomy. He gave the first full description (1836) of the chain of bright points observed along the moon's edge during a total eclipse of the sun, a phenomenon now known as Baily's Beads. He reconstructed the standards of length, determined the mean density of the earth, reformed the "Nautical Almanac," revised star catalogues, and was among the founders of the Royal Astronomical Society.

Bain (bān), ALEXANDER, philosopher and educator, born in Aberdeen, Scotland, June 11, 1818; died there, Sept. 18, 1903. He was educated at Marischal Coll. in Aberdeen and became professor of mathematics and natural philosophy at the Andersonian Univ. of Glasgow (1845). He was examiner in logical and moral philosophy at the Univ. of London (1857-62, 1864-69). In 1860 he was made professor of logic and English at the Univ. of Aberdeen and became lord rector of that institution in 1881. Besides contributing to the *Westminster Review*, he published numerous works including "The Emotions and the Will," "Manual of Mental and Moral Science," "Mind and Body," "The Senses and the Intellect," "The Study of Character," and "John Stuart Mill: a Criticism, with Personal Recollections."

Bainbridge (*bān′brĭj*), WILLIAM, naval officer, born at Princeton, N.J., May 7, 1774; died in Philadelphia, July 28, 1833. He went to sea when he was 14, and at 18 he was mate and the next year captain of a merchant vessel. In 1798 he was made a lieutenant commandant, and in 1800 he became commander of the frigate *George Washington,* which conveyed the commercial tribute levied by the dey of Algiers. He commanded the *Essex,* which cruised in the Mediterranean, and later the *Philadelphia* in the war with Tripoli in 1803. In the War of 1812 he commanded the squadron consisting of the *Hornet, Constitution,* and *Essex.* On Dec. 29 of that year he captured the *Java* off the coast of Brazil. For this service the crew was voted $50,000 by Congress as prize money and he received a gold medal. Later he commanded the Mediterranean squadron, and became president of the Board of Navy Commissioners.

Baird (*bârd*), SPENCER FULLERTON, naturalist, born at Reading, Pa., Feb. 3, 1823; died at Woods Hole, Mass., Aug. 19, 1887. His education was secured at Dickinson Coll., Pa., where he taught natural history for 10 years. Subsequently he became secretary of the Smithsonian Institution at Washington, and later chief government commissioner of fish and fisheries. He was the recipient of many medals from societies and governments. His writings include: "A Catalogue of North American Serpents," "Review of North American Birds," "Mammals of North America," and "Iconographic Encyclopedia."

Baireuth (*bī-roit′*), or BAYREUTH, a city of Germany, in Bavaria, 40 m. N.E. of Nuremberg and noted as the home of the composer, Richard Wagner (*q.v.*). The city is famous for the Wagner Music Festival, which originated in 1876 when the Baireuth Festival Theater was opened. Wagner's family home, *Haus Wahnfried,* with his grave in its garden, is also in Baireuth and Franz Liszt is buried in the city, too. The principal manufactures of the city are textiles, china, machinery (sewing machines), and musical instruments. After the surrender of Germany in 1945, Baireuth became part of the U.S. Zone of Occupation. Population, *ca.* 40,000.

Bajer (*bȧ′jĕr*), FREDRIK, statesman, born in Vestergede, Denmark, Apr. 28, 1837; died Jan. 23, 1922. Bajer became interested in pacifism in the course of extensive linguistic studies. He founded the Danish Peace Society in 1882, became affiliated with the Parisian Interparliamentary Union in 1889, and founded a similar Scandinavian organization in 1907. For many years a Deputy in the Danish Parliament, he founded the International Peace Bureau at Berne, Switzerland, in 1891, and served as its president for many terms. In 1908, Bajer was awarded, with Klas P. Arnoldson, the Nobel Prize for Peace. He wrote extensively on his beliefs concerning pacifism, and his publications were influential throughout Europe.

Bakelite (*bā′ḳē-līt*), trade name for plastic resins and compounds, including Bakelite epoxy, phenolic, polyethylene, polypropylene, styrene, and vinyl. Historically, the term Bakelite was first applied to a phenolic resin made from a combina-

BAIREUTH. FESTIVAL THEATER

tion of phenol and formaldehyde. This resin was discovered in 1907 by L. H. Baekeland (*q.v.*), for whom it was named.

Baker (*bā̆′ḳẽr*), a city in eastern Oregon, seat of Baker County, located *ca.* 160 m. E.S.E. of Portland, on a fork of the Powder River. The city is served by the Union Pacific R.R.; a commercial airport lies 4 m. S.E. of the business district. The city's principal industries include mining, lumbering, woodworking, and the raising of livestock. Baker is the seat of the Roman Catholic Diocese Cathedral of St. Francis de Sales. Other prominent buildings include the Elks Club and the Masonic Temple. The site of Baker was settled in 1865, and the city was incorporated in 1874. Population, 1940, 9,432; in 1950, 9,471; in 1960, 9,986.

Baker, NEWTON DIEHL, lawyer and statesman, born in Martinsburg, W. Va., Dec. 3, 1871; died Dec. 25, 1937. He was graduated from Johns Hopkins Univ., studied law, and began to practice in Martinsburg. He removed to Cleveland, Ohio, where he was elected city solicitor (1902-12) and mayor (1912-16). In 1916 he was made Secretary of War by President Wilson. President Hoover, in 1929, made him a member of the Law Enforcement Commission.

Baker, RAY STANNARD, author and journalist, born at Lansing, Mich., April 17, 1870; died July 12, 1946. He graduated from Michigan State Coll. in 1889 and later became a reporter. He was an editor of the *American Magazine* (1906-15), and official biographer of Woodrow Wilson. His publications include "What Wilson Did at Paris" (1919), "Woodrow Wilson and World Settlement" (3 vol., 1922), and "Woodrow Wilson: Life and Letters" (8 vol., 1927-39) for which he received the 1940 Pulitzer Prize in biography. His essays, including "Adventures in Contentment" (1907) and "Adventures in Understanding" (1925), were written under the pen-name of David Grayson.

Photo by Blank & Stoller. Courtesy Doubleday & Co., N. Y.

RAY STANNARD BAKER

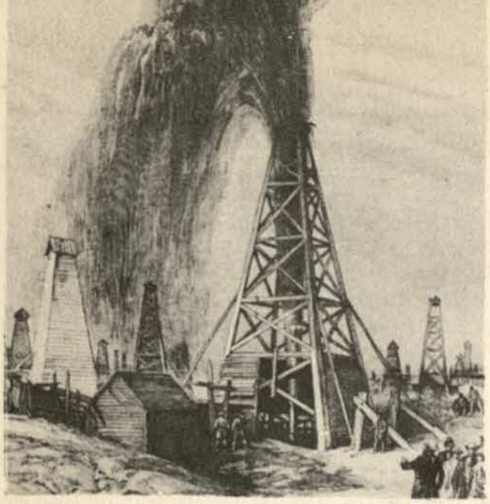
Baker, SIR SAMUEL WHITE, explorer and author, born in London, England, June 8, 1821; died Dec. 30, 1893. He established a colony in Ceylon, in 1847, and organized an expedition in 1861 to explore the source of the Nile. This enterprise led to the discovery of Lake Albert Nyanza in 1864, and an exploration of the Blue Nile and White Nile. His publications include "Eight Years' Wanderings in Ceylon," "Wild Beasts and Their Ways," and "The Rifle and the Hound in Ceylon."

Bakersfield (*bā̆′ḳẽrz-fēld*), a city in southern California, seat of Kern County, located *ca.* 110 m. N.W. of Los Angeles, at the Southern end of the San Joaquin Valley on the Kern River. The city is served by the Southern Pacific Lines and the Atchison, Topeka and Santa Fe Ry. Recreational sites near the city include Kern River County Park (345 acres) and the Tule Elk Refuge, *ca.* 1,000 acres set aside to preserve a large herd of tule elk.

The discovery of oil and natural-gas fields on nearby Kern River in 1899 has made Bakersfield an important fuel producing and refining center. Manufactures include oil-drilling equipment, electronic components, plastics, and cement products. Cattle, citrus fruits, cotton, and grains are raised in the surrounding valley. Bakersfield is the center of a standard metropolitan statistical area (8,152 sq. m.; pop., 1960, 291,984) made up of Kern County. The area's value added by manufacture, 1958, was $39,833,000; the city's value added, $20,930,000. Bakersfield was laid out in 1869, incorporated in 1873, and reincorporated in 1898. Population, 1940, 29,252; in 1950, 34,784; in 1960, 56,848.

Baking Powder, a leavening agent used as a substitute for yeast in baking. It consists of sodium carbonate and an acid substance such as cream of tartar, sodium aluminum sulphate, or a phosphate, with flour or starch added to keep the powder dry. When baking powder is moistened in the mixing process of breads or cakes, the acid and the carbonate react, liberating carbon dioxide which causes the dough to rise. Baking powders are classified according to the kind of acid substance used, as tartrate, phosphate, or sodium aluminum sulphate.

Baku (*bȧ-ḳōō′*), a port city of Russia, capital of the Azerbaijan Soviet Socialist Republic, on the western shore of the Caspian Sea. The city is strongly fortified, has a fine harbor, and is the terminus of the Trans-Caucasian Ry. The exports include salt, opium, cotton, livestock, silk, petroleum, and saffron. The manufactures include machinery, ships, ironware, pottery, clothing, tobacco products, and salt. Baku is one of the most noted centers of petroleum and naphtha production in the world. Baku gained greatly in com-



Courtesy Bettman Archive

BAKU OIL WELL IN THE 19TH CENTURY

Baku had a well developed petroleum industry as early as 1700

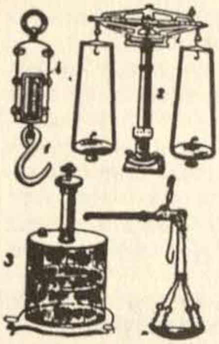
mercial importance with the inauguration of the several Five Year Plans. Population, 1939, 809,347.

Bakunin (*bȧ-ko͞o′nyn*), MIKHAIL ALEKSANDROVICH, Russian revolutionist and writer, born at Torzhak in 1814; died in Bern, Switzerland, July 1, 1876. One of Europe's leading anarchists (1861-76), he opposed Karl Marx in the First International and was expelled for his militant views in 1872. He developed a theory of revolution, known as *Bakuninism*, which advocated atheism, destruction of the state, and extreme individualism. He gained a small European following, chiefly in Spain (1870-73) and his work is credited with advancing nihilistic views in Russia. His major work, "God and the State," appeared in 1882.

Balaam (*bā′lȧm*), the son of Beor, prophet of Pethor, who lived in Aram on the River Euphrates. In Numbers 22-24 there is the story of how Balak, King of Moab, hired Balaam to curse Israel, but instead he blessed that nation and foretold for it a great future. Later Balaam was slain by the children of Israel (Joshua 13). In the New Testament (Revelation 2) Balaam is reported to have taught Balak to incite the Israelites to idolatry and other sins.

Balaklava (*băl-ȧ-klä′vȧ*), a small port on the Black Sea, in the southwestern part of the Crimea, Russia, near Sebastopol. It was the headquarters of the British during the Crimean War (*q.v.*), and from which they undertook the construction of a railroad to Sebastopol, a distance of 8 m. The harbor affords secure anchorage for the largest ships. It is a natural fort, the entrance being so narrow that only one vessel can pass into it at a time. The Russians made an attack upon it Oct. 25, 1854, but were repulsed. The famous charge of the Light Brigade of 600 men under Lord Cardigan took place at this time. They cut their way with great bravery to the Russian guns, and afterward cut their way back again. In the charge all but 150 perished. Tennyson's "Charge of the Light Brigade" was written in commemoration of this daring, but misdirected deed.

Balance (*băl′ȧns*) an instrument used to ascertain the relative weights or masses of bodies. There are various forms, but the most common are *hydrostatic balances, torsion balances,* and *steelyards.* The hydrostatic balances are used to ascertain the specific gravity of water; torsion balances to ascertain the intensity of very small forces; and steelyards, for weighing both small and large articles. *Spring balances* are used to weigh articles in which a high degree of exactness is not required. They are constructed of a device whereby a spring is activated to register the weight.



BALANCES

1. Spring balance. 2. Chemical balance. 3. Coulomb's torsion balance. 4. Antique Roman balance from Pompeii. *b,* beam; *i,* indicator; *p,* pan

Balance of Power, an expression used to indicate the condition under which a party in a legislature or congress has sufficient votes to secure the passage of a measure by casting them in favor of either one of two or more parties. The term is used in diplomacy among nations to indicate a condition whereby the influence of one or more may be cast so as to overcome the influence of other powers by a preponderance of strength. Thus, some of the European states cast their influence against Spain, then against France, and subsequently against Russia, whereby the balance of power was sufficient to secure certain concessions or to establish and maintain conditions of independence for other governments. Among the notable instances in which the balance of power was maintained in Europe may be cited the coalition formed against Napoleon I, in 1814, the concerted action to check the ambition of Russia in the Crimean War, the conclusion of the Treaty of Berlin, in 1878, to maintain the autonomy of the Balkan States, and the formation of the *Entente Cordiale* (*q.v.*) and of the Triple Alliance, between Austria-Hungary, Germany, and Italy.

Balance of Trade, in political economy, the difference between the total value of the exports and imports of a country. According to the mercantile system, the balance of trade is considered favorable when the exports of a country exceed the imports; thus gold received as payment for exports exceeds the amount expended for imports.

Balaton (*bŏ′lŏ-tôn*), or PLATTEN, a lake in Hungary, located 55 m. s.w. of Budapest. It is about 4 m. wide and 48 m. long, and has an area of 266 sq. m. A number of small streams flow into it, and the outflow is through the Kapos River, the Kapos Canal, and the Sio River, which flows into the Sarviz and thence into the Danube. Many edible species of fish are common to the lake.

Balbo (*băl′bô*), ITALO, aviator and administrator, born in Quartesima, Ferrara, Italy, June 6, 1896; died June 28, 1940. After serving in World War I, he entered politics and became a member of the Fascist party (1922). After Mussolini's rise to power, he was appointed successively minister of national economy (1925) and general of the Black Shirt militia, under-secretary for air (1926), and general of the air fleet, and air minister (1929). In this post he was responsible for the modernization of the Italian air forces, and, in 1929, he led a squadron of 12 planes from Rome to Rio de Janeiro. Four years later he piloted a round-trip mass flight of 24 planes from Rome to Chicago and New York City. Having become a national hero in Italy, he was promoted to the rank of air marshal (1933), though some historians believe that Mussolini resented Balbo's growing prominence and promoted him reluctantly. In 1933 Mussolini appointed Balbo governor general of Libya, perhaps as a kind of exile from Rome. Serving with the Italian forces in World War II, Balbo was killed during a British bombardment in an air battle over Tobruk, North Africa; it was rumored later that he had been killed by an Italian formation on Mussolini's orders.

Balboa (*bàl-bō′à*), VASCO NÚÑEZ DE, discoverer of the Pacific Ocean, born in Jeres de los Caballeros, Spain, about 1475; executed at Acla, near Darien, in 1517. He was born of a once noble family, and in 1501 joined Rodrigo de Bastidas' expedition to the New World. He spent a number of years on a plantation in Haiti, but after becoming involved in debts, smuggled himself on board a ship in order to accompany Francisco de Encisco to the new settlement at San Sebastian and thence to Darien. Becoming leader of the colony in Darien called Santa Maria de la Antigua del Darien, he explored the surrounding territory, crossed the mountains of the Isthmus of Darien in 1513, and in that year first viewed the Pacific Ocean. Francisco Pizarro, the conqueror of Peru, was with Balboa's expedition when the Pacific was sighted. Balboa was afterward named admiral of the Pacific and governor of Panama and Coyba. Pedrarias Dávila, who had been appointed governor of Darien, was jealous of Balboa's success and had him beheaded on a charge of disloyalty.

Balboa, a city on the southern coast of Panama and on the Gulf of Panama, was named for the explorer. It is the administrative headquarters of the Panama Canal (*q.v.*).

VASCO NÚÑEZ DE BALBOA

The *balboa,* the silver monetary unit of the republic of Panama, was also named after Vasco de Balboa.

Balder (*bạl′dẽr*), in Scandinavian mythology, the son of Odin and Frigga. He personified the brightness of summer, and was supposed to spread light and beauty upon mortals. It is said that the gods amused themselves by shooting arrows and throwing stones at Balder, who was invulnerable to them, until Loki, the god of evil, aimed an arrow of mistletoe at the blind god Hodur and instead killed Balder. The story goes on to say that he is to return after Ragnarok, a period of twilight, and bring to mortals the golden age. Richard Wagner made use of this myth in his "Ring of the Nibelung" (*q.v.*), a series of four operas.

Baldness (*bạld′nĕs*), lack or loss of hair; deficiency of hair, normal or abnormal. The medical term is *alopecia. Alopecia areata* is the definition for sharply circumscribed areas of baldness on the head due to certain infections of the scalp, and sometimes due to nervousness or to injury to a nerve supplying the particular scalp area. There are many types of baldness technically named according to the underlying condition. *Alopecia senilis* is the common baldness of aging. Baldness may be the result of glandular deficiency or it may be hereditary.

Baldwin (*bạld′wĭn*), the name of five kings of Jerusalem, who were members of the house of Flanders. BALDWIN I accompanied his brother, Godfrey de Bouillon, on the first Crusade to the Holy Land. He was born in 1058, became King of Jerusalem in 1100, and died in 1118. His nephew succeeded him in 1118 as BALDWIN II; he died in 1131 after a successful reign. BALDWIN III reigned as King of Jerusalem, 1143-62. BALDWIN IV was a son of Amalric I. He succeeded to the throne in 1174, but in 1183 caused his infant son to be crowned as BALDWIN V, who died in 1186. The power of Christianity began to decline in the East with the death of Baldwin III.

Baldwin, FAITH (MRS. HUGH H. CUTHRELL), novelist, born in New Rochelle, N.Y., Oct. 1, 1893. During World War I she worked with the War Camp Community Service; later she became director of the Save the Children Federation. After her marriage in 1920, she began her career as a writer of popular novels and poetry. Among her novels are "Mavis of Green Hill" (1921), "Office Wife" (1930), "White Collar Girl" (1933), "Washington, U.S.A." (1943), "Lookout for Life" (1950), and "Face Toward the Spring" (1956). Several of her novels have been made into films. Poems include "Signposts" (1924), "The Whole Armor" (1951), and "The West Wind" (1962).

Baldwin, HANSON WEIGHTMAN, military analyst and author, born in Baltimore, Md., March 22, 1903. Graduated from the U.S. Naval Acad. in 1924, Baldwin saw three years of sea duty. He became a reporter on the Baltimore *Sun* in 1928. In the following year he joined the staff of the New York *Times,* becoming military and naval correspondent in 1937 and military editor in 1942. Before and during World War II Baldwin came to be considered an outstanding military writer. Generally, his analyses proved his knowledge in the field, although he underestimated the endurance of the Red Army during its struggle with Germany. He was awarded a Pulitzer Prize in 1942. His books include "The Caissons Roll" (1938), "United We Stand!" (1941), "The Price of Power" (1948), "Sea Fights and Shipwrecks" (1955), "The Great Arms Race" (1958), and "World War I; An Outline History" (1962).

Baldwin, JAMES ARTHUR, author, born in New York, N.Y., Aug. 2, 1924. The eldest of nine children, he undertook factory work in 1943 to help support the family when his father died shortly after Baldwin's graduation from high school. He was determined on a career as a writer, however, and spent several years in a futile endeavor to make a living in this field. In 1948, embittered at the racial situation in the U.S., he went abroad and made his home in Paris, France. His first book, the novel "Go Tell It on the Mountain," was published in the U.S. in 1956, and in the following year Baldwin returned to New York. His other published works include "Another Country" (1961); an essay on race relations, "The Fire Next Time" (1963); and articles and stories in many periodicals.

See *American Literature,* for illustration.

Baldwin, JAMES MARK, philosopher and psychologist, born in Columbia, S.C., Jan 12, 1861; died in Paris, Nov. 8, 1934. After graduating from Princeton in 1884, he studied in Germany. He was professor of philosophy at the Univ. of Toronto (1889), taught psychology at Princeton Univ. (1893-1903), and taught psychology and philosophy at Johns Hopkins Univ., Baltimore, Md. (1903-09). He also lectured at the National Univ. of Mexico until 1913, and later at Oxford and in France. He was one of the founders of the *Psychological Review,* and published a number of books, including "Darwin and the Humanities," "History of Psychology," "Story of the Mind," and "The Individual and Society." He was editor-in-chief and contributor of the "Dictionary of Philosophy and Psychology." Oxford Univ. (England) awarded him (1900) its first honorary Doctor of Science degree.

Baldwin, MATTHIAS WILLIAM, inventor and manufacturer, born in Elizabethtown, N.J., Dec. 10, 1795; died in Philadelphia, Sept. 7, 1866. He first devised a new process for bookbinding, and afterward turned his attention to machinery. In 1832 he built his first engine, *Old Ironsides,* for the Philadelphia, Germantown & Norristown R.R. He founded the Baldwin Locomotive Works in Philadelphia.

Baldwin, ROGER, official of the American Civil Liberties Union, born in Wellesley, Mass., Jan. 21, 1884. Educated at Harvard, he received his M.A. degree in 1905. He moved to St. Louis, Mo., where he was instructor in sociology at Washington Univ. (1906-09) and chief probation officer, juvenile court (1907-10). He continued with social work in St. Louis until 1917. He served a one-year sentence as a conscientious objector during World War I. In 1918, following a period of travel in the U.S., he joined the American Civil Liberties Union (*q.v.*), serving as its director in 1920-50. He gained a national reputation for devotion to free speech, democratic ideals, and opposition to all forms of totalitarianism. Baldwin taught at the New School for Social Research (1938-42), and in 1947 he surveyed civil liberties in Japan and Korea. His writings include "A New Slavery, Forced Labor" (1953) and many pamphlets.

Baldwin, STANLEY, 1ST EARL BALDWIN OF BEWDLEY, statesman, born in Bewdley, Worcestershire, England, Aug. 3, 1867; died in Stourport-on-Severn, Dec. 13, 1947. He was graduated from Cambridge in 1888 and later assumed leadership of his father's iron and steel interests. He entered Parliament in 1908 and held his first government position in 1917. He succeeded Bonar Law as head of a Conservative government in 1923. He was succeeded by James Ramsay MacDonald when his party lost the election of that year. He was again prime minister, 1924-30, and again gave way to a Labour government. In 1931 Baldwin became lord president of the council in the national government, which was established at the height of a worldwide economic crisis. He was prime minister again in 1935-37. Considered typical of British political thought and philosophy of government between the two World Wars, he is best remembered for the enactment of tariff protection of certain industries, outlawing general strikes, a kind of *laissez-faire* attitude to the danger of German rearmament, and the advice he gave to Edward VIII in the constitutional crisis precipitated by the latter's abdication. After his retirement (May 28, 1937), he was made an earl.

Bâle (*bäl*). See *Basel.*

Balearic Islands (*băl-ē-ăr′ĭk*), a group of islands in the Mediterranean Sea, off the east coast of Spain. They include Majorca, Minorca, Iviza, Formentera, Cabrera, and several others. The total area is *ca.* 2,000 sq. m. Majorca is much the largest of the islands; its area is 1,405 sq. m. Palma, on Palma Bay, in the southwestern part of Majorca, is the largest city in the islands, with a population of *ca.* 150,000. These islands were visited by the Greeks before the rise of Roman power. They were long subject to Carthage and in *ca.* 123 B.C. became part of the Roman empire. King James I, of Aragon, held them from 1220 to 1235, and in 1375 they were united to Spain. The soil is productive and yields large quantities of cereals and tropical fruits, especially olives, bananas, and grapes. Population, *ca.* 430,000.

Balfe (*bălf*), MICHAEL WILLIAM, musician and composer, born in Dublin, Ireland, May 15, 1808; died in London, Oct. 20, 1870. He studied music in Italy and gained fame as a vocalist in performances at Milan, Paris, and in England. His best-known operas are "The Bohemian Girl," "The Maid of Artois," "The Rose of Castile," "Siege of Rochelle," and "The Enchantress."

Balfour (*băl′fo͝or*), ARTHUR JAMES, 1ST EARL OF BALFOUR AND VISCOUNT TRAPRAIN, statesman, born in Scotland, July 25, 1848; died near Woking, March 19, 1930. Educated at Eton and Cambridge, he entered Parliament in 1874 as a Conservative and won early recognition. In 1878 he became secretary to Lord Salisbury, then foreign minister, whom he accompanied to the Berlin Congress. In 1902 he succeeded Lord Salisbury as prime minister, but his party lost power in 1905. He replaced Winston Churchill as first lord of the Admiralty in 1915, and he was foreign minister in 1916-19. In this capacity, he issued the *Balfour Declaration* (see *Zionism*). Balfour represented Great Britain at the Washington disarmament conference (1921-22). He received his earldom in 1922. Among his books are "A Defence of Philosophic Doubt" (1879), "The Foundations of Belief" (1895), "Essays and Addresses" (1893 and 1905), and "Theism and Thought" (1923).

Balfour, JOHN HUTTON, botanist and physician, born in Edinburgh, Scotland, Sept. 15, 1808; died there, Feb. 11, 1884. He was professor of botany at Glasgow (1841) and at Edinburgh (1845). Besides contributing to periodicals and works of reference, he published a number of books on botany and organized the Botanical Society of Edinburgh. His publications include a manual of botany, a classbook, and "Phyto-Theology."

Courtesy K. P. M. Lines

BALINESE GIRL

Bali (*bä′lē*) or LITTLE JAVA, an island in the Republic of Indonesia, located east of Java. It has an area of *ca.* 2,100 sq. m. The surface is mountainous and volcanic, but the coast and valleys are fertile and the climate is healthful. Among the chief products are sugar, peanuts, rice, tobacco, cotton, maize, indigo, and fruit. The natives are Malayan and adhere to the Hindu religion. The picturesque island, a South Sea paradise with luxuriant plant life and colorful scenes and people, has long attracted tourists, writers, and artists. In addition to the beautiful landscape and climate, Bali offers examples of exquisite native craftsmanship in gold and silver, fine pottery, richly designed textiles, and numerous other indications of a high culture. Fine ancient temples, native feasts, and dancers are also features of the distinctive charm of Bali.

First reached by Dutch explorers in 1597, Bali was later under British control (1811-16), but after 1849 Dutch rule was firmly established. Bali was captured by Japanese forces during World War II in February 1942. British troops occupied the island after the Japanese surrender in 1945. Following the war and the subsequent nationalistic uprisings against the Dutch control of the islands, Bali became a part of the state of East Indonesia within the newly formed Republic of Indonesia. Population, *ca.* 1,000,000. See also *Indonesia.*

Baliol (*bāl′yŭl*), JOHN DE, Scottish king, born in 1249; died in 1315. He was chosen King of Scotland in 1292 by Edward I of England, to whom the question of who should occupy the throne had been submitted for adjustment after a competition between Baliol and Robert Bruce. Although he had sworn loyalty to the King of England, he made a treaty with France in 1295 with the view of throwing off English sovereignty. He renounced allegiance to Edward, but was compelled to give up his crown in 1296 when Edward invaded Scotland. He was imprisoned in England until 1299. In 1302 he was allowed to settle on his estates in Normandy, where he died. His father, Sir John Baliol, founded Balliol Coll., Oxford. His son, Edward Baliol, became King of Scotland on Sept. 24, 1332, but was deposed after a reign of three months, and died in England in 1363.

Balkan (*băl'ḳạn*), anciently called *Haemus,* a range of mountains in Eastern Europe, which includes the Montenegro, Herzegovina, and Dinaric Alps, but the name is commonly applied only to the mountains extending through Bulgaria. The elevations are from about 4,000 to nearly 10,000 ft. Tchar-dagh, in the western part, is the highest peak (elevation, 9,700 ft.). The mountains are crossed by highways and several railroads, and yield minerals and lumber. They form the watershed between the Lower Danube and the streams flowing into the Aegean Sea.

Balkan States, a term applied to the independent states of Rumania, Yugoslavia, and Bulgaria, located on the Balkan peninsula, a region of Europe lying between the Black and Adriatic Seas. The Balkan peninsula properly includes Albania and Greece.

Balkh (*bälḳ*), a town in Afghanistan, on the Balkh River. It is surrounded by a fertile country and has considerable trade in produce, carpets, and shawls. Timur destroyed the larger part of its buildings and it was plundered in 1825. It has not been improved to any extent since that time. Anciently the site was occupied by the city of Bactra. Population, about 12,000.

Balkhash (*bȧl-ḳäsh'*), or BALKASH, a large lake in Siberia, the fourth in size of the lakes in Russian Asia. In breadth it varies from 6 m. to 50 m.; length, 330 m.; and area, 8,500 sq. m. The lake is 780 ft. above sea level, is salty, and has no outlet. A navigable stream, the Ili River, and several others, flow into it. The lake is quite shallow, ranging from 30 to 80 ft. in depth, and its fisheries are not important.

Ball (*ba̤l*), term for any one of a number of games in which a spherical body is thrown, rolled, kicked, or struck with a stick. As outdoor exercises they are healthful and popular amusements, and they are widely played for financial profit and to test skill. The various games include baseball, football, cricket, basketball, polo, golf, lawn tennis, etc. The "Odyssey" mentions games played with balls, and ball playing was popular in the gymnasia of Greece and at the baths of Rome. Lacrosse is a game originated by the Indians of North America. Cricket (*q.v.*) is much played in England, and baseball (*q.v.*) is the most popular game in the U.S.

Ball, THOMAS, sculptor, born in Charlestown, Mass., June 3, 1819; died in Montclair, N.J., Dec. 11, 1911. Ball began as a painter of portraits and miniatures but after 1851 gave his time to sculpture. His first work was a bust of Jenny Lind, the singer. He gained recognition with a life-sized bust of Daniel Webster. In 1854 he went to Florence, Italy, where he remained until 1897, except for the years 1857-65, when he was in the U.S. His most famous works are an equestrian statue of George Washington (Boston Public Garden) and a group, "Emancipation" (Washington, D.C.), depicting Lincoln's freeing of the slaves. Ball was also an accomplished singer. He published his autobiography in 1801.

Ballad (*băl'ạd*), a compact, simple narrative poem of a single episode, intended to be sung or recited. The ballad is not to be confused with the French *ballade,* a complex and fixed form consisting of three stanzas with refrain, and an *envoi* (dedicatory postscript) usually addressed to the poet's patron or other person of importance. François Villon and Geoffrey Chaucer (*qq.v.*) wrote extensively in the *ballade* form. In music the term ballade is applied to a short lyrical form, usually for piano or orchestra, which was originated by Frédéric Chopin and adopted by such composers of the romantic period as Johannes Brahms, Franz Liszt, and Edvard Grieg.

In the popular mind, ballads are loosely, but incorrectly, associated with any simple, rhymed narrative based on folk material. The true ballad flourished in England during the 15th and 16th centuries and may have originated somewhat earlier, although no extant ballad has been traced to a period earlier than the 15th century.

The conventional ballad stanza contains four lines of four and three stressed accents alternating. The themes are "true love," death, and adventure. Frequently all three of these elements are to be found in one ballad. The "true love" usually culminates in tragedy. The second and fourth lines are rhymed and sometimes meaningless, evidently intended as a refrain and perhaps to be sung by a chorus in response to the first and third lines. Through the skillful use of repetition and suggestion, a haunting and powerful emotional effect is obtained. The word "black" nearly always signifies death, and "bed," the grave, even if it be the marriage bed. The inevitability of the pairing together of joy and sorrow, life and death, love and loss of love was of immediate knowledge to the folk who made the ballads.

Not all ballads are sad, and there is frequently a sort of ironic humor in the midst of sadness. In the ballad "Sir Patrick Spens," for example, the drowning of the Scots lords is indicated by the line "They wat their hats aboone." The story is sad, the image is vivid, and there is an undeniable element of wry humor which is enhanced by the lilting rhythm of this and most other ballads. The use of ritualistic words and phrases also makes it possible to tell a long story in a short time, thereby heightening the emotional impact.

The preservation of these English ballads is due largely to Bishop Thomas Percy's collection "Reliques of Ancient English Poetry" (1765) and to Sir Walter Scott's "Minstrelsy of the Scottish Border" (1802).

The singing of ballads has had a strong vogue in America in recent years. Concerts by folk singers have been frequent and well attended. The tunes to which the ballads are set have a rhythmic swing, and they are easily remembered. Some of the great ballads, such as "Edward," have been set to more formal music and appear regularly on the recital programs of the great singing artists. Franz Schubert and Carl Loewe wrote many ballads of this type.

Characteristic ballads of the Scottish border, where a high proportion of them originated, are "Sir Patrick Spens," "Lord Randall," and "Barbara Allen." Most American folk songs, chiefly from the South and the West, are not true ballads. "Composed" ballads, which have a known author and imitate the popular ballad to some extent, include "The Rime of the Ancient Mariner" by Samuel Taylor Coleridge and "The Highwayman" by Alfred Noyes.

The term ballad opera, although rarely used, today, refers to a type of production, *e.g.*, "The Beggar's Opera" (*q.v.*), which features simple songs resembling ballads.

Ballantyne (*băl'ạn-tīn*), JAMES, printer, born in Kelso, Scotland, in 1772; died in Edinburgh, Jan. 17, 1833. With Sir Walter Scott (*q.v.*) as a silent partner, Ballantyne established a printing plant in Edinburgh, which published Scott's work. He was also in the book-selling business in which his brother and Scott had a share. A financial collapse resulted in the loss of his fortune and that of Scott. Ballantyne was for a time editor of the Edinburgh *Weekly Journal.*

Ballantyne, ROBERT MICHAEL, author, born in Edinburgh, Scotland, April 24, 1825; died in Rome, Italy, Feb. 8, 1894. He went to Canada when he was 16 and served in the Hudson's Bay Co. (1841-47). Returning to Scotland in 1847, he published his first book, "Hudson's Bay: or, Life in the Wilds of North America" (1848). A prolific writer of stories for young people, he drew from personal experiences. Among his best stories are "The Young Fur-Traders" (1856), "The Coral Island" (1857), and "The Dog Crusoe" (1860); he also was the author of "Personal Reminiscences of Book-making" (1893).

Courtesy Australian News & Information Bureau, N. Y.

BALLARAT, AUSTRALIA

Sturt St., the city's principal thoroughfare

Ballarat (*băl'lạ-răt*), a city in Australia, capital of Victoria, 73 m. w. of Melbourne. Founded in 1851 as a miners' settlement in what was once one of the world's largest gold-mining areas, the city today has smelting plants, woolen mills, brass foundries, breweries, and other industries. Dairying and mixed farming are carried on extensively in the rich agricultural countryside surrounding it. A school of mines, part of the Univ. of Melbourne, Anglican and Roman Catholic cathedrals, and botanical gardens are situated in the city. The Ballarat rebellion, or Eureka riots, took place here (1854), in which the miners used violence in opposing oppressive license fees. After their defeat in a bloody encounter (Dec. 3), the law was modified. Population (with suburbs), 1960, 54,800.

Ball and Roller Bearings (*ba̤l, rōl'ẽr bâr'ĭngz*), mechanical supports for rotating shafts to minimize friction. Ball bearings are usually found on high-speed machinery carrying moderate loads, roller bearings on heavier-loaded machinery. Primary parts—rings and rolling elements—are made of high-grade hardened steel to extremely exacting tolerances. The efficiency of bearings depends on choice of lubricants. Inadequate lubrication, or extremely high loads or speeds, may cause excessive friction, overheating, and failure. Bearings are usually equipped with rotating seals which retain lubricant and exclude foreign matter and corrosive materials which might cause wear. The efficiency of modern, smooth-running machinery can be attributed largely to extensive use of bearings.

Ballet (*băl'ā*), a performance of dance and pantomime accompanied by music and usually with scenery and costumes. The work may or may not have a story. The word "ballet" comes from the Italian word *ballare,* meaning "to dance."

"Ballet" is also used to define a specific dance technique based upon the perpendicular frontality of the human body and with a vocabulary proceeding from a "scale" of five basic positions. The vocabulary of classic ballet was established and codified in the 17th century and has been further refined, but not substantially changed, since then.

The first sustained evidence of ballet-type performances can be found in 16th-century Italy, England, and France. In Italy, there were elaborate combinations of pantomime, verse, singing, and dance at the palace of the Medici. In England, masques flourished at the courts of Henry VIII, Elizabeth I, and James I, but the advent of the Puritan Commonwealth temporarily inhibited the growth of ballet in England.

The French evolved a complex form of court ballet. Catherine de Medici imported works she had known in Italy, and in 1581 the history-making *"Ballet Comique de la Reine,"* by Balthasar de Beaujoyeux, was performed. It was the first dramatic ballet, and an account of it published in 1582 was the earliest ballet souvenir program.

"BALLET COMIQUE DE LA REINE"

This first dramatic ballet was performed in 1581 at the court of Henri III of France, under the sponsorship of Catherine de Medici

The form of this work, and of all court ballets to follow, consisted of a musical overture, a series of *récits* (sung prologues mostly rendering homage to the king), *entrées* (a danced section after each *récit*), and a *grand bal* (in which the performers danced with the spectators). The dancing was based upon the social forms of the time and required very little of the specialized technique of today.

The court ballet received its greatest impetus under Louis XIV. In 1661 the Royal Acad. of Dance was founded under his patronage, and *ca.* 1670, it was reorganized. An attempt was then made to establish a terminology of steps and to improve dance technique in general.

The composer Jean-Baptiste Lully (*q.v.*) and the choreographer Pierre Beauchamps (1639-1705) appeared in the court ballets, and it was Beauchamps who devised the five positions of the feet (with related positions of head, arms, and shoulders) that are still used as points of departure and return in all phases of classical movement.

As a theatrical form, the court ballets received a special impetus from Molière, whose *comédies-ballets,* like *"Le Bourgeois gentilhomme,"* integrated dance and literary content.

Ballet as an expressive, rather than decorative, art saw further fruition with the collaboration of Gasparo Angiolini (1722-96) and the composer Christoph W. von Gluck (*q.v.*) on "Don Juan" (1761). Its greatest champion was Jean-Georges Noverre (1727-1810). Feeling that the use of elaborate libretti and spoken and sung words were unnecessary, Noverre devised the *ballet d'action,* a combination of pantomime and pure dance that told its story through movement, rather than through words. He also made costume innovations, most important of which was the elimination of masks for the dancers so that facial expressions could be related to gesture.

With Jean Dauberval (1742-1806), a pupil of Noverre, the *ballet d'action* was extended to comic themes. Dauberval's *"La Fille mal gardée"* is today the oldest ballet in the active repertoire.

By the end of the 17th century, courtiers had tired of performing in the ballets, and the era of the virtuoso dancer had begun, with such performers as Françoise Prévost (1680-1741), Marie Sallé (1707-56), Marie Camargo (1710-70), La Barberina (Barberina Campanini, 1721-99), Gaétan Vestris (1729-1806), Maximilien Gardel (1741-87), and Madeleine Guimard (1743-1816).

As the romantic era reached its peak at the end of the first third of the 19th century, leading ballet performers became so important that they were virtually deified. They included Marie Taglioni (1804-84), Carlotta Grisi (1821-99), Lucile Grahn (1821-1907), Fanny Elssler (1810-84), Fanny Cerito (1821-99), Arthur Saint-Léon (1815-70), Jules Perrot (1810-92), and Lucien Petipa (1815-1900).

The romantic era, with its nostalgia for the faraway and fairylike, its belief in mystical love stronger than death, and its interest in pastoral

PRIMA BALLERINA

Marie Taglioni, shown here as *Flore* in the ballet *"Flore et Zephire"* (1830), typifies the ethereal style of the Romantic period in Europe

STARS OF THE BALLETS RUSSES

Vaslav Nijinsky and Tamara Karsavina, leading dancers in Serge Diaghilev's company, perform *"Le Spectre de la Rose,"* choreographed by Michel Fokine (1911)

themes, was ideally suited to ballet. Filippo Taglioni (1776-1871) epitomized these trends in *"La Sylphide"* (1832), the story of a Scotsman torn between his peasant bride and an elusive forest-creature. The finest work of the period, however, is "Giselle" (1841), by Jean Coralli (1779-1854).

The word "Russian" is for many people synonymous with ballet. Yet Russia did not come strongly into the picture until Charles Didelot (1767-1837) went there (1801) from France and reformed the Imperial School of Ballet. He paved the way for another French ballet master, Marius Petipa (1822-1910). The choreography of Petipa (notably "The Sleeping Beauty") was not in the expressional vein of the romantics. It was a classic concept, with classroom exercises and phrases embellished and enhanced into a theatrical form.

With the 20th century, new influences began to stir in Russia, which were to have world-wide repercussions. In the theater, Stanislavsky (*q.v.*) was teaching the value of realism. In the dance, Isadora Duncan (1878-1927) made a visit that was to affect the young Michel Fokine (1880-1942).

Fokine began to experiment—a ballet without the traditional hard-toed shoes ("Daphnis and Chloë"), a ballet with a serious attempt at characterization (*"Carnaval"*)—and, in 1908, he was brought to the attention of his fellow-Russian, Serge Diaghilev (*q.v.*). Diaghilev was a young aesthete, at that time more interested in painting and in presenting Russian art in the salons of Europe than in dance. In 1909 he organized a season of Fokine ballets in Paris. Notable on that first program was *"Les Sylphides,"* Fokine's exquisite re-creation of the mood of romanticism. By 1911, with "Petrouchka," Fokine had achieved his goal of a work with a profound sense of character development expressed in dance.

The Ballets Russes de Serge Diaghilev (1909-29) is probably the most celebrated company in ballet history. In addition to Fokine, it nurtured the careers of Vaslav Nijinsky (*q.v.*), Léonide Massine (1896-), and George Balanchine (1904-). It made Europe aware of the sumptuous beauty of Russian art. As time went on, it also produced a generation of French painters, composers, and dancers.

The visits of the Diaghilev company to England were the inspiration for the development of an indigenous company. The two most important contemporary British ballet directors, Ninette de Valois, of the Royal Ballet, and Marie Rambert, of the Ballet Rambert, began their careers in the Diaghilev group.

Although ballet in America received its strongest impetus in the post-Diaghilev era of the early 1930's, it has a longer history. The first American-born dancer to achieve a national reputation was John Durang (1768-1822), who made his debut in Philadelphia. The 19th century produced Augusta Maywood, the first American to make her debut at the Paris Opéra; Mary Ann Lee, the first American woman to achieve nationwide fame as a classic ballerina; Julia Turnbull; and George Washington Smith.

During this period, foreign dancers were beginning to tour the U.S., the most beloved, Fanny Elssler, in 1840. And in 1866 an American theater production containing an elaborate ballet had its *première* at Niblo's Gardens, in New York City. It was "The Black Crook," with Charles Costa as choreographer and Mlle. Marie Bonfanti as prima ballerina. The work was frequently revived until 1909, and in 1929 it received an additional revival in Hoboken, N.J., with dances by the choreographer Agnes de Mille (*q.v.*).

Probably the greatest stimulation to American interest in ballet was the Russian artist Anna Pavlova (*q.v.*). Until 1925, hers was the only company regularly touring the entire U.S. To this day, in many areas, her name is synonymous with ballet.

ANNA PAVLOVA

In "The Dying Swan," a role created for her by Michel Fokine in 1905, and with which she became eternally identified

Pavlova's principal partner in America was Mikhail Mordkin (1881-1944). He finally settled in New York City and, in 1937, formed the Mordkin Ballet. This company was the nucleus for the Ballet Theatre, founded two years later.

Although the Diaghilev Ballets Russes visited the U.S. in 1916, its influence was local, affecting principally the cultural life of New York City. It was not until after his death, when key people from his group began to come to America, that the great era of Russian ballet was born in the U.S.

The early history of this movement is fairly complex. In 1932 Col. Wassily de Basil and René Blum organized a Ballet Russe de Monte Carlo in Europe. This company was the predecessor of an American company later called the Original Ballet Russe.

In 1936 Blum and de Basil separated, and Blum organized the Ballet Russe de Monte Carlo with Michel Fokine as ballet master. Léonide Massine and a group of sponsors bought out the Blum Ballet Russe de Monte Carlo in 1938. In 1943 Massine left the company to form the short-lived Ballet Russe Highlights company, but he soon went back to Europe. Serge Denham then took over the Ballet Russe de Monte Carlo. The company tours the country extensively but is virtually devoid of Russian personnel. At its height, the company relied strongly upon Massine ballets, such as *"Le Beau Danube," "Gaîté Parisienne,"* and *"Le Tricorne."* And it was for the Ballet Russe that he created his symphonic ballets, such as "Seventh Symphony" and *"Rouge et Noir."* He also tried out works with American themes. But it remained for American choreographers, for example, Eugene Loring, with his "Billy the Kid" (1938), and Agnes de Mille, with her "Rodeo" (1942), to capture images of their own country.

While the Ballet Russe was presenting a Franco-Slavic repertoire, several American companies were in the making. In New York, Lincoln Kirstein had invited George Balanchine to become principal teacher at the School of American Ballet and to become artistic director of a proposed company. In Philadelphia, the Littlefield family had a school and company. In Chicago, Ruth Page and Adolph Bolm were heading a vigorous ballet movement. And in San Francisco, the Christensen family was laying the groundwork for a future San Francisco ballet.

The Kirstein-Balanchine project gave its first performance in 1934. In 1946 it began two seasons under the title of Ballet Society; and in 1948 it became the New York City Ballet.

AMERICAN BALLERINA

Maria Tallchief and Nicholas Magallanes, in the New York City Ballet version of "The Nutcracker"

Although the New York City Ballet has presented works by Jerome Robbins, Antony Tudor, Todd Bolender, Francisco Moncion, Lew and William Christensen, and other contemporary choreographers (including, in 1959, the modern-dance choreographer Martha Graham), the company is built essentially about the output and point of view of George Balanchine. His is a prolific and civilized choreographic gift, featuring predominantly nondramatic works based upon musical structure. Notable are "Serenade," "Symphony in C," "Divertimento," "Agon," and "The Four Temperaments."

Almost at the same time as the New York City Ballet, Ballet Theatre, later called The American Ballet Theatre, was founded. While the Ballet Russe was essentially a transplanted Slavic organization, and the New York City Ballet was the reflection of one man's temperament, the Ballet Theatre was built upon an eclectic base. It had classic and modern repertoire, and it had American, British, and Russian wings.

The American wing produced such choreographers as Jerome Robbins ("Fancy Free," "Interplay," "Facsimile") and Michael Kidd ("On Stage!"). The British wing fostered Antony Tudor ("Pillar of Fire," "Lilac Garden," "Undertow," "Judgment of Paris"). The Russian wing was notable principally for Fokine's restaging of his own works.

All three companies have produced uniquely fine dancers, among them, Nora Kaye, Maria Tallchief, Melissa Hayden, Jacques d'Amboise, John Kriza, Alicia Alonso, Ruth Ann Koesun, Mary Ellen Moylan, and hosts of others.

While American ballet was enjoying its first upsurge in the 1930's, the Sadler's Wells Ballet (later to become the Royal Ballet) was

THE SADLER'S WELLS BALLET IN "THE SLEEPING BEAUTY"

Courtesy Hurok Attractions, N.Y.

taking hold in Great Britain. And in Denmark the Royal Danish Ballet also began to move ahead. In Russia, the ballet, once the plaything of royalty, began to develop a less refined and more deliberately folklike style. Once centered in St. Petersburg, it had moved its activities to Moscow. None of the national ballet groups has developed choreographers of the distinction found in the U.S., however. For them, ballet has developed more as a performing art than as a creative one.

Ballistics (*bạ-lĭs′tĭks*), the study of the laws governing the motion of projectiles. *Exterior* ballistics is concerned with projectiles in flight, *interior* ballistics with projectiles within a gun. See also *Missile*.

Balloon (*bạ-lo͞on′*). A lighter-than-air device designed for flying. The simple balloon is a gastight, spherical envelope filled with a gas that is lighter than air, such as hydrogen or helium, and fitted with a gondola or car slung from a netting passing over the envelope. In its practical applications the balloon is a powered vehicle with a streamlined shape incorporating engine "eggs" on the surface, within, or immediately adjacent to the envelope, a housing for passengers and crew and, as a dirigible, an inner rigid framework.

The construction of such a flying machine was first suggested by the flight of birds and the rising of soap bubbles into the air, which led to the construction of two classes of airships, one heavier than air, propelled upward by mechanical contrivances and the other lighter than air, by rarefied gases. Balloons propelled upward by means of gases were the first of several devices for aërial navigation with which it was possible to secure satisfactory results. They depended upon the principle that a body lighter than air will rise with a force proportional to the difference between the weight of the air it displaces and its own weight. The gas employed was usually hydrogen, which is about fourteen times lighter than air, but coal gas was also used, which is about three times lighter than air.

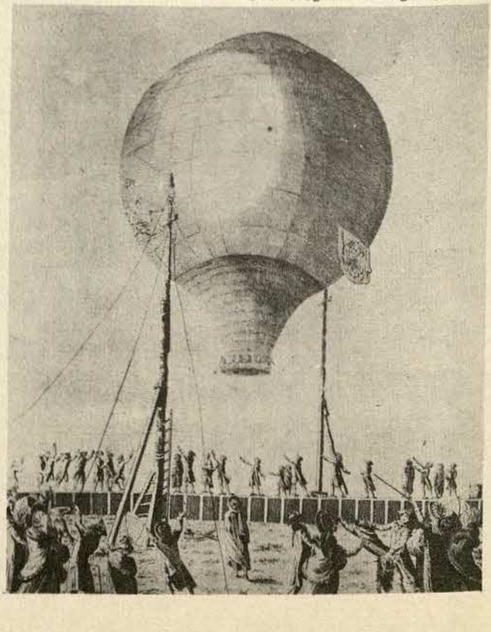
The first scheme to navigate the air of which we have definite record was made in 1670 by Francis de Lana, a Jesuit, who proposed to raise a vessel by metallic globes, containing vacuum inside. However, the scheme was not practical, because metallic globes that would raise a vessel could not be made strong enough to resist the pressure of the surrounding air, or, if made strong enough, they would be too heavy to rise. The type of balloon which has been most serviceable to make long "free" flights was invented in 1782 by Stephen Montgolfier and his brother Joseph, paper-makers of Lyons, France. They gave a successful public exhibition June 5, 1783, with a balloon filled with air rarefied by means of a fire lighted in the car. Later M. Charles, professor of physics in Paris, succeeded in successfully substituting hydrogen gas for rarefied air, by means of which an ascent of 3,000 ft. was made, the balloon passing over Paris and landing safely. The next year M. Blanchard made an ascent and carried with him a parachute to assist in making an escape in case of accident. He crossed the English Channel from Dover to Guines, and in 1802 M. Garnerin made the same exploit and landed safely in London by means of a parachute. Two years later M. Gay-Lussac made an ascent from Paris to a height of 23,000 ft. Ballooning thereby became flying's first man-carrying device, and was established on a well-known principle: one element will float in another element of greater density. Just as a piece of lead will float in a dish of mercury, so will heated (rare) air, hydrogen or helium float in ordinary air.

Ballooning appealed to the popular imagination in the U.S., and early in the 20th century, when lighter-than-air flight had become a commonplace, an effort was made to cross the Atlantic by balloon. It failed. Balloons were used for artillery observation purposes and scouting during the American Civil War (see *Aviation:* MILITARY). During the First World War tethered balloons were used as a "barrage" protection in London, and during the second big armed conflict of the 20th century refined specimens of the barrage balloon were employed over populous centers

BALLOON INVENTED BY THE BROTHERS MONTGOLFIER

The balloon, 100 ft. in diameter and 130 ft. high, burst on January 19, 1784, while 3,000 ft. in the air

Courtesy Aero Digest, N. Y.



Courtesy Aero Digest, N. Y.

U. S. NAVY'S SPHERICAL RACING BALLOON OF 1931

This bag traveled 215 m. to win the 1931 National Elimination Balloon Race

throughout the world as a defense against low-flying air raiders. The free balloon, at the will of the wind, meantime was employed only for sports purposes, except for scientific experiments.

Balloons have been used in reporting weather conditions, carrying instruments thousands of feet into the air for this purpose, and in exploring space. The U.S. satellite known as Echo I was rocketed into space on Aug. 12, 1960, reaching an orbit about 1,000 m. above the earth. The 137.4-lb., aluminum-coated plastic balloon, 100 ft. in diameter, was used to reflect radio signals from one point on earth to another. A record for manned balloons was set a few days later, when Capt. Joseph W. Kittinger, U.S.A.F., reached 102,800 ft. on Aug. 16, 1960.

Forerunners of these explorations were the two Englishmen, James Glaisher and Henry Coxwell, who are considered to have been the first to ascend to the base of the stratosphere (1862) in an open gondola type of balloon; they flew 37,000 ft. in altitude. Another famous but more recent explorer of the stratosphere is the Belgian physicist, Auguste Piccard, who made several balloon ascents into the stratosphere in 1931, 1933, and 1934, with the special purpose of studying cosmic rays.

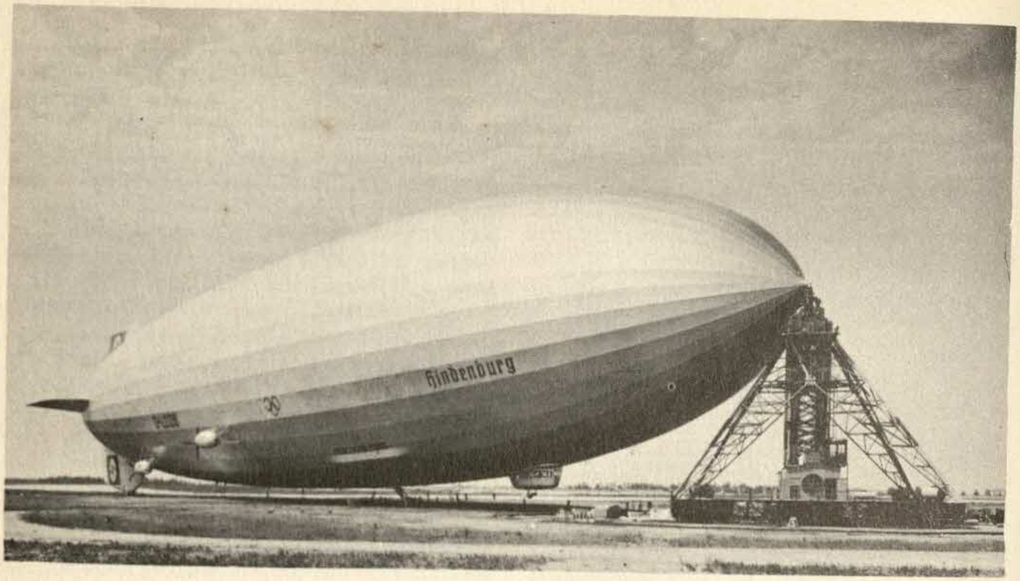
Powered lighter-than-air craft fall into three classifications: blimps, semi-rigids, and rigids.

The blimp is a gas bag with a streamlined shape, fitted with one or more engines and propellers for propulsion. It gained its name during the First World War when the British designated it as aircraft type B-limp; when it was bereft of lifting gas it collapsed, having no internal framework. Later versions incorporated a light framework in the nose for frontal rigidity in the face of air resistance induced by forward speed. The blimp has been employed commercially for sightseeing flights. During the United Nations-Axis war it was employed for convoy, scouting and anti-submarine work. Blimps carry from 200,000 to 300,000 cu. ft. of gas.

Predecessors of the blimp were non-rigid powered balloons fitted with internal combustion engines. Late in the 19th century powered balloons were used extensively by sportsmen and aviation enthusiasts. One of the most famous of the lighter-than-air pilots of the time was the Brazilian, Alberto Santos-Dumont, who was the first to fly around the Eiffel Tower of Paris under full control. Soon after the turn of the century the Army purchased a powered balloon; it was the Army's first powered military aircraft.

Semi-rigid airships have a metal framework at the base of the envelope which carries the engines, controls and cabin. It was in a semi-rigid that Walter Wellman (1908), famous American flier, attempted flights over the North Pole and across the Atlantic. He was unsuccessful. The Italian, Gen. Umberto Nobile, did negotiate a flight across the North Pole (1928) in a semi-rigid, the "Italia," but he crashed on his return trip.

The rigid airship, or dirigible, has been by far the most spectacular performer in the field of lighter-than-air flight. At one and the same time it acquired fame as a long-distance traveler and as a bad luck contrivance. Dirigibles have been involved in some of aviation's worst disasters. Count von Zeppelin of Germany, and in later years Dr. Hugo Eckener, also of Germany, were the chief proponents of dirigible flight, as opposed to heavier-than-air flight. Through many vicissitudes, Von Zeppelin labored to perfect his large aircraft from the time of his first flight over Lake Constance, Germany, in 1900. The first commercial airlines were established with what came to be known as "Zeppelins." One of the early Zeppelins, the "Viktoria-Louise," spent 1,244 days in active service in a little more than two years beginning in 1912, flew about 70,000 m. and carried a total of nearly 3,000 persons. Zeppelins raided England during the first two years of the First World War. In 51 raids more than 500 persons were killed and three times that many injured. British anti-aircraft defense thereafter made the Zeppelin raids too costly. Pre-war and war experience of the French with rigid airships was limited. After the war a British dirigible, the "R-34,"



Courtesy Aero Digest, N. Y.

THE "HINDENBURG"

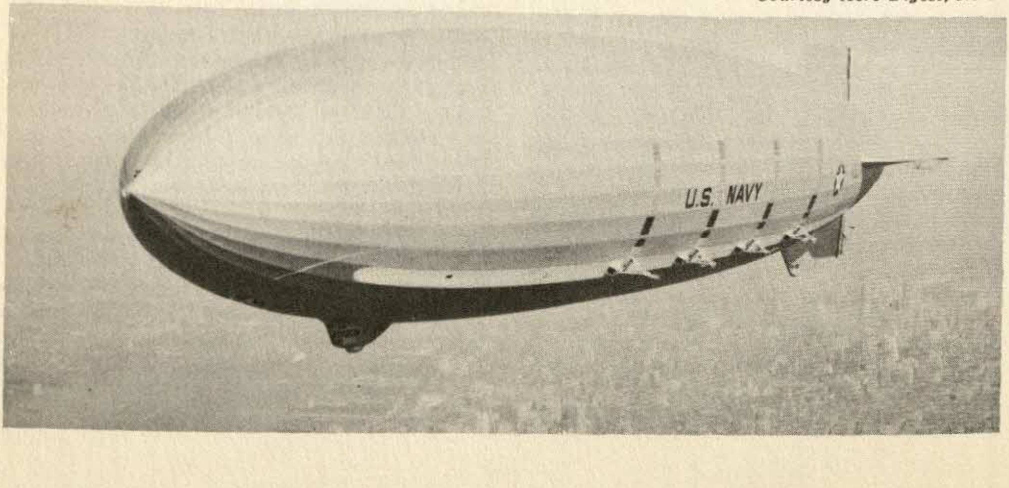
which was 643 ft. long, 80 ft. in diameter and carried 2,000,000 cu. ft. of gas, made a round trip over the Atlantic Ocean to the U.S., but in the next decade a series of sad experiences led the British to abandon all work on this type of aircraft. Meantime interest had been stimulated in the U.S. by the flight of the "R-34." The U.S. Navy ordered a dirigible from England, but on a test flight it broke in two, caught fire, and plunged to the ground. Five persons aboard survived, 45 perished. The final chapter in British lighter-than-air craft was written in 1930 when the "R-101," a new type, crashed in France, carrying to their death many talented British aeronautical figures.

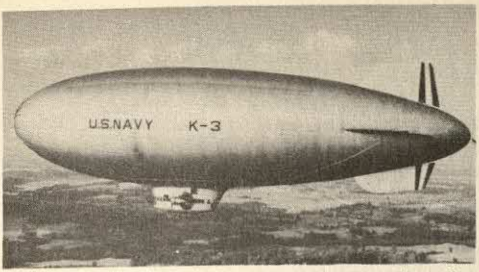
The Germans persisted. Their "Graf Zeppelin," world traveler, made her first trial flight in 1928 and circumnavigated the world in 1929 in nine days, 20 hours, with a crew of 40 and 14 passengers. She explored the Polar regions and established regular seasonal service to North and South America before being retired. She was replaced by the "Hindenburg," a much larger airship. In its second season of operation the "Hindenburg" caught fire and was destroyed during landing operations at Lakehurst, N.J., U.S. Naval Air Station, in May 1937. All airships, save those flown

AIRSHIP "MACON" OVER LOWER MANHATTAN

This rigid airship, designed to house small fighter aircraft within her belly, had a capacity of 6,500,000 cubic ft. and was 785 ft. long. The last of the pre-World War II dirigibles of the U. S. Navy, the "Macon" was lost off the California coast in 1935

Courtesy Aero Digest, N. Y.





Official U. S. Navy Photo, courtesy Aviation Magazine

U. S. NAVY "K"

This blimp, or non-rigid lighter-than-air ship, containing 416,000 cu. ft. of non-inflammable helium lifting gas, is 250 ft. long. It is capable of cruising for two days without returning to its base

by the U.S., had been filled with the inflammable gas, hydrogen.

The U.S. acquired a rigid airship, renamed the "Los Angeles," from Germany after World War I. The "Los Angeles" flew many thousands of miles, filled with helium, without mishap before it was dismantled, over-age. The U.S. was less lucky with airships of its own construction. Successively it lost the Navy airships "Shenandoah," "Akron," and "Macon." The "Akron" carried to their deaths 73 of her crew of 76 in 1933. Only two of the "Macon's" crew of 83 lost their lives (1935) when she broke up, however. Since the "Macon," the U.S. has built no rigid airships.

Champions of the rigid airship insist that it has a place in common carrier transportation. It is more commodious, if slower—it cruises at less than 100 m.p.h. as compared with 300 m.p.h. or more for large transport heavier-than-air craft—than the airplane. It is quieter and has fantastic cruising ranges. The only nation with the natural resources to experiment safely with dirigibles is the U.S. The Department of the Interior owns the only wells in the world where non-inflammable helium gas can be produced in usable quantities. Helium has only slightly less lifting capacity than hydrogen. The besetting fault of dirigibles has been the necessary lightness of the internal structure; sudden great stresses have caused the airships to break up. See *Aeronautics; Air Mail; Aviation*, and color plate, *Man Masters the Air*, Volume II.

Balloon Fish, a kind of fish native to the tropical seas. They are peculiar for their power to inflate themselves with air, which they do to evade pursuit, and when in that condition float on the surface of the water with their back down. The flesh is not eaten.

Ballot (*bălʹlŭt*), a term derived from the French, signifying a little ball used in voting. In ancient Greece balls made of stone or metal were used to express verdicts. This custom is still common in some countries for limited purposes, and also in clubs and groups for voting on the admission of applicants to membership. In Greece the practice was called the *die-cast;* it is now generally termed *balloting*. In societies a given number of black balls thrown in will defeat the candidate, who is then said to be *blackballed*. Various forms of ballots of paper, wood, and stone have been used for centuries. The common ballot now used in governmental affairs is of paper, and its honesty and secrecy are protected by the law. See *Australian Ballot.*

Ball's Bluff (*bąlz blŭf*), a steep bank on the Potomac River, in Loudoun County, Virginia. It was the scene of a battle between the Union forces and the Confederates on Oct. 21, 1861, when a small Federal army was surrounded and defeated. The latter lost heavily, and their leader, Col. E.D. Baker, was slain.

Balm (*bäm*), a plant of the mint family, noted for its fragrance. It is perennial, has ovate and crenate leaves, and is used in medicine as a stimulant and aromatic. The oil of balm, derived from this plant, is an essential oil. Several species are found in Eurasia, especially along the Mediterranean, and some varieties have been naturalized in England and America. The catmint, or catnip, resembles the balm but does not belong to the same class. The Moldavia balm is used for flavoring in Germany and the bastard balm is cultivated in England for its fragrance, which the leaves retain a long time after being dried.

Balmaceda (*bäl-mä-sāʹTHä*), JOSÉ MANUEL, soldier and statesman, born in Santiago, Chile, in 1840; committed suicide Sept. 19, 1891. Though educated for the church, he entered politics, and became a leader of the Liberal party in Chile. He was president for five years, beginning in 1886. At the end of his term he refused to surrender the presidency, and became involved in war, but was defeated. Attempting to flee with $1,000,000, he missed his passage on a British ship, and thereupon committed suicide.

Balm of Gilead (*gĭlʹē-ąd*), the resinous substance derived from a tree native to Arabia. It is referred to in the Old Testament and mixed with oil it is the chrism of the Roman Catholic Church. It is obtained by making incisions in a small tree, *Commiphora opobalsamum*. At first it is white, but afterward turns to a golden yellow color and resembles honey in consistency. By boiling the fruit and the wood an inferior quality is obtained. It is irritating to the skin and has a bitter taste. The odor is highly fragrant.

Balmoral Castle (*băl-mŏrʹąl*), the autumnal residence of the royal family of England, situated 45 m. w. of Aberdeen, Scotland. It occupies an elevated site 920 ft. above the sea, a natural platform that slopes gently to the Dee River, and is surrounded by beautiful mountain scenery. The estate contains about 40,000 acres, purchased in 1852 by Prince Albert, and on it is the magnificent castle built at his own expense at a cost of $500,000.

It is constructed of granite in the Scotch baronial style of architecture. Edward VII made a number of important changes in its furnishings and decorations.

Balsam (*bạl′sạm*), an aromatic, resinous substance secured from plants containing volatile oil and resin. Many substances sold in the market are known as balsam, but the balsams of Peru and Tulu are most generally used in medicine. The former is obtained from a tree native to tropical America and the latter from the forests of Tulu, on the Magdalena River. The balsam of copaiba is a yellowish liquid with a bitter taste, with a more or less viscid consistency, and is the product of trees found in South America and the West Indies. Another product of this class, the balm of Gilead (*q.v.*), is imported from Arabia. These products are generally used in the arts, for medicine, and in making perfumery. See also *Canada Balsam*.

Balsam, a flowering plant of India, but naturalized in all the continents. It has been cultivated for more than three centuries for its beautiful flowers, some of which are double and are known as *camellia*. The plant grows from 1 to 2 ft. in height and branches freely. Many varieties of colored flowers have been secured by propagation.

FLOWERING BALSAM

Baltic (*bạl′tĭk*), BATTLE OF THE, a naval contest on the Baltic Sea, Apr. 2, 1801, between the English under Sir Hyde Parker and Lord Nelson, and the Danish fleet, in which the latter was defeated.

Baltic Provinces, name formerly applied to a section of Russia, bordering on the Baltic Sea, including the three governments of Courland, Esthonia, and Livonia. The area is 64,844 sq. m. In 1919 the region was formed into the three republics of Lithuania, Latvia and Esthonia. Letts and Esths make up the bulk of the people, and the burghers include many Germans. Formerly Courland was a dependency of Poland and Esthonia and Livonia belonged to Sweden. Peter the Great annexed Courland in 1795 and the remainder was previously acquired by conquest from Sweden. The people are largely Protestant and were not in strict harmony with the Russianizing policy of the Czarist government. These provinces revolted and declared a republic at the time of the Russo-Japanese War, in 1904, but the movement was suppressed by military force. The Germans (under Gen. von Hindenburg) invaded this region in 1915, and again in 1941 during World War II. For history since 1919, see *Estonia, Latvia, Lithuania*. Population, *ca.* 6,000,000.

Baltic Sea, the inland sea that washes the shores of Denmark, Sweden, Russia, and Germany, and communicates with the North Sea by the Kattegat, the Sound, and the Great and Little Belt. The length is about 800 m.; breadth, 100 to 200 m.; depth, 40 to 140 fathoms; and area, including the Gulfs of Bothnia and Finland, 184,497 sq. m. The islands within the sea have an area of about 12,000 sq. m. In the northern part is the Gulf of Bothnia, which is separated from the southern portion by a chain of islands, and in the eastern part are the Gulfs of Finland and Riga. It receives the inflow from 250 rivers, which renders its waters almost fresh, and increases its tendency to freezing in the winter season, thus impeding navigation from three to five months of the year. The largest rivers that flow into it are the Niemen, Duna, Oder, Neva, Vistula, Narva, and Trave. It has a large trade, both with ports in Europe and in other continents. The leading harbors are at Stockholm, Memel, Danzig, Riga, Kronstadt, Kiel, Stettin, Copenhagen, and Helsingfors. It is connected with the North Sea by the Kaiser Wilhelm Canal (*q.v.*) and other canals furnish communication with divers trade centers. Navigation is dangerous on account of breakers at numerous islands, sudden changes of wind, and violent storms. Valuable amber is cast ashore by waves in Prussia and Courland. There are extensive salmon, trout, and herring fisheries. The southern coast of Sweden is gradually sinking and the upper coast rising, the rate of change being estimated at about 3 ft. in a century.

Baltimore (*bôl′tĭ-môr*), a city and port of entry in northern Maryland, the leading city of the state and sixth-largest in the nation. In Baltimore County, it is an independent city. It is located on the Patapsco River, and, including its industrial suburbs, it occupies most of both shores of the river from Chesapeake Bay to the head of tidewater. Situated midway between North and South, the city is 38 m. N.E. of Washington, D.C., and covers an area of 92 sq. m.

DESCRIPTION: Ranking among the five greatest ports in the U.S. in total tonnage of foreign trade (exports and imports combined), Baltimore is the only major port on the Atlantic with two outlets to the ocean: a southern outlet through the Chesapeake Capes and a northern one via the Chesapeake and Delaware Canal. The city is served by the Baltimore & Ohio and the Pennsylvania R.R.'s and the Western Maryland Ry. The municipally owned Friendship International Airport is located 10.5 m. from the center of the city.

Baltimore has been known as the "Monumental City" since the building of the 204-ft. Washington Monument (1815-29) at Charles and Monument Sts., the first such memorial to be started. The Battle Monument (1815-27) at Fayette and Calvert Sts., and Fort McHenry, now a national monument, on Locust Point, commemorate Baltimore's role in the War of 1812.

The city contains several noteworthy examples of 18th-century architecture. "Mount Clare," in Carroll Park, the oldest house in Baltimore (1760), St. Paul's Rectory at Cathedral and Saratoga Sts., and "Homewood" on the campus of Johns Hopkins Univ. represent the Georgian country house, while Otterbein Church, oldest in the city (1784), at Conway and Sharp Sts., typifies Georgian church architecture. The Carroll-Caton House, at Lombard and Front Sts., represents the fully developed town house. In the Fells Point area (around the foot of Broadway) are numerous examples, often somewhat altered, of the artisans' narrow, two-room rowhouses, which, with a rear wing added, later evolved into the typical Baltimore rowhouse with white marble steps.

Other religious and cultural landmarks of the city include the Basilica of the Assumption of the Blessed Virgin Mary (1806-21), first Roman Catholic cathedral in the U.S.; the First Unitarian Church (1818), where the principles of that denomination were first expounded; and the (Roman Catholic) Cathedral of Mary Our Queen (dedicated, 1959). Walters Art Gallery has a renowned collection representing all periods, and the city-owned Museum of Art in north Baltimore has widely known paintings, prints, ceramics, and sculpture, with recent French schools well represented. Peabody Inst. is nationally famous for its reference library and music school (see *Peabody, George*), and the Enoch Pratt Free Library is a model of efficient layout and operation (see *Pratt, Enoch*). The Municipal Museum, built in 1813 by Rembrandt Peale, is the oldest building in the country erected for museum use. Here, in 1816, the practical use of illuminating gas was first demonstrated. Baltimore is also the site of the tomb and the restored home of Edgar Allan Poe (*q.v.*).

COMMERCE: Since 1730, when Baltimore was laid out, the town has revolved around its port. Long a leading shipbuilding center, its yards launched one-tenth of the World War II emergency fleet. Well equipped to handle bulk shipments, it imports and distributes iron, chrome, manganese, tin, coffee, chemicals, petroleum, sugar, cork, rubber, copper, and tropical fruits to over half of the states and to parts of Canada. Serving similar areas, it exports grain, coal, iron and steel products, fuel oil, machinery, tractors, buses, lumber, scrap metal, electrical tools, paints, and manufactured chemical products and spices.

Baltimore has a balanced economic development. In addition to its shipping importance, it is an industrial, financial, and insurance center, a wholesale and retail distribution market, and headquarters for many corporations and governmental agencies. Its major industries include primary metals; transportation equipment, including shipbuilding and repairing; food and kindred products; apparel; ordnance and fabricated metal products; chemicals and allied products; electrical machinery; and printing and publishing. It is the center of the Baltimore standard metropolitan statistical area (1960 pop., 1,727,023), which includes Baltimore (city and county) and Anne Arundel, Carroll, and Howard counties and which in 1958 had a value added by manufacture of $1,963,553,000. The city alone had a value added of $1,062,535,000.

Courtesy Baltimore Ass'n. of Commerce

BALTIMORE

Mt. Vernon Square with Washington Monument

lic schools currently amounts to more than 150,000 pupils, and another 39,000 study in parochial schools. Baltimore is also the site of several universities and colleges. The professional schools of the Univ. of Maryland, including an early school of medicine and the nation's oldest school of dentistry (1840) are grouped around Lombard and Greene Sts. Near the Museum of Art is Johns Hopkins Univ. (*q.v.*). In east Baltimore is Johns Hopkins Medical Center, consisting of a hospital, school of medicine, and school of public hygiene

Courtesy Baltimore Ass'n. of Commerce

BALTIMORE SKYLINE

and health. Other institutions include Coll. of Notre Dame of Maryland, Inc., St. Mary's Seminary and Univ., Morgan State Coll., and Loyola Coll. Goucher Coll. is located in Towson, 4 m. N. of the city. The U.S. Army maintains a military counter-intelligence school at Ft. Holabird.

GOVERNMENT: Incorporated in 1797, the city was the seat of Baltimore County from 1768 until its separation and establishment, in 1851, as an independent city responsible for both municipal and county functions. Its current charter dates from 1947. Baltimore is governed by a mayor and a unicameral council of 21 members, all elected for four-year terms. The city-supported police department is state controlled, and state courts direct judicial affairs.

HISTORY: Although a first settlement was made here in the mid-17th century, the city was not established until 1729. During the Revolutionary War, Maryland troops, including many Baltimoreans, saved the American army on Long Island and bore the brunt of the southern campaign. From Dec. 20, 1776, to Feb. 27, 1777, the Continental Congress met in Baltimore. During the War of 1812, the city repelled a British attack by land and sea (Sept. 12-15, 1814). During the bombardment of Ft. McHenry, Francis Scott Key (*q.v.*), detained under British guard aboard an unknown American cartel vessel, was inspired to write the words of "The Star-Spangled Banner" (*q.v.*). His original manuscript is preserved at the Maryland Historical Society in Baltimore.

In 1828 construction of the Baltimore & Ohio R.R. was begun, and in 1830 the line was the first in the country to offer public freight and passenger service. The first serious bloodshed of the Civil War flowed at Pratt and Commerce Sts., April 19, 1861, when a mob attacked Federal troops marching between railroad stations. Union forces promptly fortified Federal Hill, at Warren and William Sts., and occupied the city until after the war. A disastrous fire on Feb. 7, 1904, leveled the business section of the city and led to better planning in the rebuilding of the city which followed. Although Baltimore had turned, in the post-Civil War period, to the South, a main region of trade and commerce before the conflict, and had materially aided in the reconstruction of that destitute area, richer fields existed to the north and west, and the city's economic growth was limited until it developed markets in these areas. Both World Wars spurred industrial growth. In recent years, community development programs for Baltimore have included the replacement of numerous slum and blighted areas by housing projects.

Much discussed in recent years has been the city's professional baseball team, the Orioles, whose American League franchise was shifted from St. Louis in 1953. The team was the first major league team to play in Baltimore since 1903.

POPULATION: In 1890 Baltimore had a population of 434,439. The decade 1910-20 saw the city's largest numerical growth, from 588,485 to 733,826. In 1950 the population was 949,708; in 1960, 939,024.

Baltimore, BARONS. See *Calvert.*

Baltimore Oriole. See *Oriole.*

Baluchistan (*bä-lo͞o-chĭs-tän′*), or BELUCHISTAN, a region of West Pakistan, in the southwestern part of the province, and bordering on the Arabian Sea. The area—134,139 sq. m.—is made up of a former chief commissioner's province, with headquarters at Quetta, and the former Baluchistan States Union, a merger of four states—Kalat, Kharan, Las Bela, and Makran. The region is mountainous and is generally arid, with only 3-10 in. of rainfall annually and with short, seasonal rivers, but there are fertile valleys in the north, where wheat, barley, millet, and rice are grown, and highlands, where melons, grapes, pomegranates, and apricots are cultivated and where camels, horses, sheep, and goats are raised. The mountains have valuable mineral deposits, including coal, gypsum, chromite, limestone, sulfur, and lead, but these are little exploited, chiefly because the region lacks adequate roads and railroads. Local handicrafts include hand-loom weaving, basket-making, and embroidery.

The region was held by the Arabs from the 7th to the 10th century and came under Mogul control in the 17th century. It was later ruled by tribal chiefs, but after the Afghan Wars the northern section came under British rule, under a series of treaties (1876, 1879, and 1891). The region was incorporated into Pakistan in 1947. Population (1951), 1,788,000.

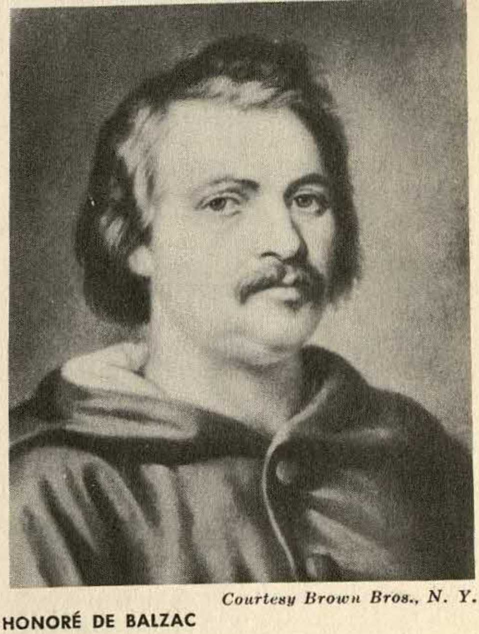
Baluster (*băl′ŭs-tẽr*), or BANISTER, in architecture, the name of small shafts or pillars used to support a cornice or coping. Balusters are employed in stairways as guards, in bridges as parapets, and for a number of other uses. The material used in construction may be wood, cement, metal, or stone, and in form they differ largely, being usually ornamented in workmanship and beautified by polish and paint.

Balzac (*bạl′zăk*), HONORE DE, novelist, born at Tours, France, May 20, 1799; died at Paris, Aug. 20, 1850. Honoré Balzac, who ennobled his name quite arbitrarily in 1831, was, without doubt, the greatest novelist in the French language. His position in French literature is often compared to that of Shakespeare as the greatest dramatist in English. He shares with Shakespeare the never-excelled compass of his inventions, the tremendous width of an imagination which brought to life an endless variety of human characters.

Balzac was born into a typical French middle-class family of peasant origin. He spent a rather unhappy youth in various boarding schools and colleges, visiting his home only infrequently. Even there, he suffered from his mother's possessiveness and his father's lack of understanding. Eventually he worked in the office of a notary, passing his examination for a law degree in 1819. In the same year, however, deciding to become a man of letters, he went to Paris and wrote under various pen names, producing sensational novels and thrillers, as well as philosophical and social essays. In this occupation he was barely able to make a living and did not achieve either the desired fame or money. From 1825 on, he tried his luck in business enterprises as publisher, printer, and typefounder, but was consistently unsuccessful, accumulating only ever-increasing debts. About 1829 he published "The Chouans," and, after certain love affairs with older women, "The Physiology of Marriage," which brought him fame and the social success in which he was rather snobbishly interested.

He then became a contributor to various Paris journals. However, despite his new fame and the large sums he received for his writings, his life ever remained an unceasing struggle to satisfy his creditors. In spite of his untiring efforts, never equalled by those of any other writer, Balzac never achieved economic security. His pretentious attempts to maintain himself in the style of an aristocratic man of the world did not deter him from his work, to which he devoted all his nights and many daytime hours, sustained by vast quantities of coffee. Emotionally, he was always bound to women, always necessarily aristocratic, from his first love, Mme. de Berny, 20 years his senior, to the Duchess d'Abrantès, to the "Etrangère," his last and greatest love, the Polish Countess de Hanska. During their 18 years of relationship he met her only rarely, sometimes traveling with her. Only in his last year of life did he marry her, four years after the birth of their child (who died).

Out of the nightmare of Balzac's life, a fantastic mixture of continuous strenuous work, never-ceasing emotional excitement and economic pressures, some of the greatest novels of the 19th century were born. The erstwhile scribbler of dime novels had developed into the greatest prose



Courtesy Brown Bros., N. Y.

HONORÉ DE BALZAC

writer of France. In his novels he not only created unforgettable human characters but also described the fate of whole families through generations and thus gave a complete picture of the French civilization of his time. The most famous of his novels are *"La Peau de chagrin"* ("The Magic Skin") *"Le Père Goriot"* ("Father Goriot" or "Old Goriot"); *"Illusions perdues"* ("Lost Illusions"); *"Splendeurs et Misères des courtisanes"* ("Scenes from a Courtesan's Life"); and *"La Cousine Bette"* ("Cousin Betty"). The whole of his novels fall into a pattern known in its entirety as *"La Comédie humaine"* ("Human Comedy"), a counterpart of Dante's "Divine Comedy." He is also well known for a group of tales, *"Contes drôlatiques"* ("Droll Tales").

Bamberg (*băm'bĕrg*), a city of Germany, in Bavaria, near the confluence of the Main and Regnitz rivers, once an influential archiepiscopal see (1007-1802). Bamberg dates as a city from 973. It is the site of many noteworthy buildings, including one of Germany's great Romanesque cathedrals. Its manufactures include beer and textiles. Following World War II it was occupied by U.S. forces. Population, *ca.* 50,000.

Bambino (*băm-bē'nō*), Italian, meaning baby; in art (especially in the Renaissance period in Italy), term applied to the representation of an infant, principally the Christ Child.

Bamboo (*băm-bōō'*), a giant grass (of the genus *Bambusa* and others) native to tropical America, Africa, and Asia. Many species have been described, ranging from the low, climbing forms to those which attain a height of 80 to 100 ft. Although the stems are jointed and very hard, they are both light and elastic. These plants are widely distributed, ranging from the marshes and swamps near the level of the sea to altitudes of 15,000 ft., and they grow both in wet and dry soil. They can be propagated from the young shoots or from the seeds, which resemble rice. The seeds and young shoots are eaten, while the jointed stems are used for building purposes, fences, water pipes, masts for boats, walking sticks, ladders, and in the manufacture of paper. Bamboo is used for construction purposes in some sections of Asia, primarily in southern Asia.

Bampton (*bămp'tŭn*), ROSE (MRS. WILFRED PELLETIER), singer, born in Cleveland, Ohio, Nov. 28, 1909. She studied at the Curtis Inst. of Music and sang with the Philadelphia opera before making her 1932 debut with the Metropolitan Opera. Although her New York debut role was that of the mezzo-soprano *Laura*, in *"La Gioconda,"* Miss Bampton also sang contralto and soprano roles. She stayed with the Metropolitan until 1951, becoming familiar, too, to concert, radio, television, and recording audiences.

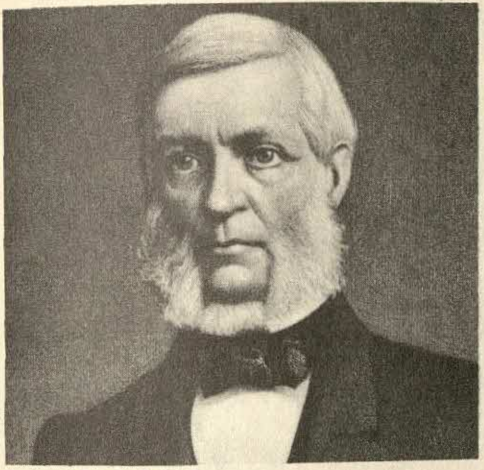
Banana (*bȧ-năn'ȧ*), one of the largest herbaceous plants, somewhat resembling the palm tree, and bearing fruit of great economic value. The banana (an African name) belongs to the genus *Musa*, of the family Musaceae. It was first found in the East Indies, but has been brought to and is successfully cultivated in all tropical and semitropical climates. An herb, unlike any other fruit, the banana does not grow like a true plant. Its trunk, for example, consists of the closely compacted sheaths of the fallen leaves. As the plant grows, the stem pushes up from the ground through the false trunk, and emerges from the top of the plant, where it becomes pendant and bears flowers. The flowers develop into bananas, each plant producing but one bunch of fruit, which is formed in clusters of upturned "hands." It often grows to a height of 25 ft., but dies down each year and is replaced the following season by new sprouts, which arise from the underground stem. The banana is integral to the diet of peoples living in tropical regions; indeed, its food value is extensive. Besides being valuable as a food plant, the plant produces fibers which are used in weaving cloth.

Banat (*băn'ăt*), a rich farming region located partly in Yugoslavia and partly in Rumania; formerly called the *Banat of Temesvar* (a pre-World War I district of southeastern Hungary), divided (1919) between Rumania and Yugoslavia. The region is bordered by the Danube on the S., the Thiess on the W., the Mures on the N., and the Transylvanian Alps on the E. The old Hungarian town of Temesvar (Rumanian, Timisoara) is the chief city of the Banat, and an important commercial, industrial, and railroad center. During World War II, the Banat's western or Yugoslav part was seized by Hungary, but returned in 1947. Population, *ca.* 1,500,000.

Bancroft (*băn'krŏft*), EDWARD, inventor, writer, and counterspy, born in Westfield, Mass., Jan. 9, 1744; died in Margate, England, Sept. 8, 1821. Possessing a quick, facile mind, Bancroft led an adventurous life, settling for a time in Guiana, where he made valuable observations of the native culture. He later moved to London, becoming a writer on American subjects and mingling in diplomatic and scientific circles. Having a natural bent for intrigue, he embarked upon the career of a spy at the outbreak of the American Revolution. He performed many missions for Benjamin Franklin in London, while, at the same time, he acted the profitable role of counterspy for the British, supplying them with advance information on American foreign policy. He was also known as the inventor of important dyes used in the manufacture of textiles.

Bancroft, GEORGE, historian, born at Worcester, Mass., Oct. 3, 1800; died in Washington, D.C., Jan. 17, 1891. He was graduated from Harvard Coll. and received his doctorate from Göttingen Univ., Germany. On his return to the U.S. in

1832, he taught briefly at Harvard. The first volume of his monumental work, "A History of the United States" (10 vols., 1834-74), and his numerous articles critical of Federalists earned him the favor of the Democrats, who started him on his political and diplomatic career. As Secretary of the Navy under President Polk, he founded the U.S. Naval Acad. in 1845. He was minister to Great Britain (1846-49) and minister to Prussia (1867-74), continuing, meanwhile, the writing of his great work. Although his history is little read today, it marked an important stage in the development of American historiography, written, as it is, in the tradition of German scholarship and permeated with the theories of the intensely partisan political Democrat.



GEORGE BANCROFT

Bancroft, HUBERT HOWE, historian, born in Granville, Ohio, May 5, 1832; died in San Francisco, Calif., March 2, 1918. Settling in San Francisco in 1852, Bancroft became the largest book dealer in the West. As a hobby, he began to collect reference works on the history of the American West, the complete collection amounting to some 60,000 volumes. This library, now at the Univ. of California, is the greatest single source for Western history. Bancroft edited and supervised the publication of a voluminous history of the West, "The Works of Hubert Howe Bancroft" (1874-90).

Band (*bănd*), an ensemble of musicians, who play, for the most part, wind instruments; most such groups also include percussion instruments of various types. The modern band originated as the military band, used to stir the martial spirit of troops and to signal their attacks. Thus, the march has always been characteristic of band instrumentation. The concert band is of recent development, with the first American organization of its kind established in 1859 by Patrick S. Gilmore in Boston, Mass. Other celebrated American bandmasters are John Philip Sousa and Edwin Franko Goldman (*qq.v.*). Besides brasses, woodwinds, and percussion instruments, the concert band also utilizes such stringed instruments as the cello, the contrabass or double bass, and the harp. Dance and jazz bands, on the other hand, make use of a widely varied instrumentation.

The term band is also applied to any ensemble composed of one kind of instrument, such as a brass band, a marimba band, or a wind band.

Bandage (*bănd'ĭj*). See *First Aid.*

Banda Islands (*bàn'dà*), a group of 10 volcanic islands in the central Moluccas, eastern Indonesia, *ca.* 60 m. s. of Ceram in the Banda Sea; area, 16 sq. m. Famous in the spice trade, the islands produce nutmeg, mace, and fruits. They were discovered by the Portuguese in 1512 and conquered by the Dutch in 1621. The capital is Bandanaira (pop., *ca.* 6,000), the islands' seaport. Population, *ca.* 13,000.

Banda Oriental (*bän'dä ō-ryăn-täl'*), the former name for Uruguay. It is now applied to the fertile alluvial plain in the south of the country, where nearly all the population is settled and almost all the agricultural crops are grown.

Bandello (*bän-dĕl'lô*), MATTEO, writer, born at Castelnuovo, Piedmont, Italy, in 1480; died in Agen, France, in 1565. He is still considered one of the major Italian writers of prose tales, his coarse, Boccaccio-like *nouvelles* dealing with the theme of immorality. His version of "Romeo and Juliet" was probably the source for Shakespeare's play.

Bandicoot (*băn'dĭ-kōōt*), any one of several kinds of small marsupials distributed over Australia and adjacent islands. There are a dozen species. The size ranges from that of a mouse to that of a large rabbit. In appearance, bandicoots resemble very long-nosed rats with wide-open shortish ears. Their fur is a yellowish-brown color above and yellowish-white below. Most live in burrows, from which they emerge at night to feed on insects, worms, fruits, and young plants.

Bandoeng (*bän'dŏŏng*) or BANDUNG, a city in West Java, Indonesia, the capital of the Priangan district. Located on a plateau 2,400 ft. above sea level, it has a remarkable climate and is a popular resort. It is a bustling, modern city with excellent rail, road, and air communications. Other features include a large quinine factory, and, nearby, one of the most powerful radio stations in the world. It was occupied by the Japanese during most of World War II. Population, *ca.* 165,000.

Bandwagon (*bănd'wăg'ŭn*), a vehicle used to transport a band of musicians, first used as an advertising stunt in 1871. Usually the bandwagons were very high and colorfully decorated to attract attention. Hence, the expression, "to climb on the bandwagon," means to join up with a group or movement, usually political, headed toward popularity and success.

Baneberry (*băn′bĕr-ĭ*), a common plant of the genus *Actaea*. A hardy perennial, it has a terminal cluster of flowers, deeply-toothed leaves, and poisonous berries. Several species are common to the woods of North America.

Baner (*bȧ-när′*), JOHAN, soldier, born at Djursholm, near Stockholm, Sweden, June 23, 1596; died in Halberstadt, Germany, June 20, 1641. As a Swedish general during the Thirty Years' War, he served Gustavus Adolphus against Poland, Russia, and Germany, and was one of the king's chief generals.

Banff (*bămf*), a town of Canada, in Southwestern Alberta, on the Bow River. Situated in the heart of the Canadian Rocky Mts. and on the main line of the Canadian Pacific R.R., Banff is the headquarters of the Banff National Park. Hot sulphur springs, nearby Lake Louise, and beautiful mountain scenery have made the region one of the most widely known resort areas in North America. Population, 1951, 2,357.

Bangalore (*băn-gạ-lōr′*), a city of India, the capital of Mysore state, 190 m. w. of Madras. An important rail, air, and commercial center, it manufactures cotton, silks, carpets, earthenware, and aircraft parts. Dating from 1537, the city was captured by the British under Lord Cornwallis in 1791; it was restored to the rajah of Mysore 20 years later. Population, 1951, 2,127,061.

Bangka (*băng′ḳȧ*) or BANKA, an island of Indonesia, in the Java Sea, off the southeast coast of Sumatra, with an area of 4,609 sq. m. Located in a world-famous tin-producing region, Bangka is also rich in gold, lead, copper, and manganese. Pangkalpinang is the capital. Population, *ca.* 200,000.

Bangkok (*băng-ḳŏḳ′*), the capital of Thailand, located on the Menam River, *ca.* 20 m. from the Gulf of Siam. The city is Thailand's industrial and governmental center and the kingdom's main port. Shipyards, sawmills, oil refineries, and rice mills abound. One of the largest cities in southern Asia, it is the main entry point into Malaya and Upper Burma and has one of the best airports in the East. The population is an amalgamation of all Asian nationalities and races, with a predominance of Chinese. The old city was built on pontoons above the river, its narrow streets and canals presenting a strong contrast to the modern sector built in Western fashion around the magnificent royal palace. An excellent example of Thai architecture, the palace stands on an island in the river, including within its huge compass several Buddhist temples, government offices, a theater, and library. The colorfully-tiled and gilded temples of Bangkok add to the opulent beauty of the city. Formerly an agricultural village, its modern history dates from 1769 when it became a stronghold against the Burmese then in control of the country. Population, 1947, 884,197.

Courtesy Canadian Pacific Steamships

TEMPLE PAGODA WAT-TSCHING AT BANGKOK

The largest temple in Siam, this structure is a fine example of Siamese ornamental architecture

Bangor (*băng′gôr*), the seat of Penobscot County, Maine, 60 m. N.E. of Augusta. At the head of navigation on the Penobscot River, and across the Kenduskeag River from Brewer, Bangor is located on the Maine Central R.R. Commercially important as a port of entry, the city is also an outlet for agricultural and dairy products and one of the leading lumber depots of the U.S. Manufactures include furniture, varied lumber products, shoes, and tools and equipment. Bangor Theological Sem. (Congregational) is located here, as well as the permanent army base at Dow Field. The vicinity was first settled in 1769; it was known first as Kenduskeag Plantation and later as Sunbury. The name was changed to Bangor when the town was incorporated in 1791. A city charter was granted in 1834. Population, 1950, 31,558.

Bangorian Controversy. See *Hoadly, Benjamin.*

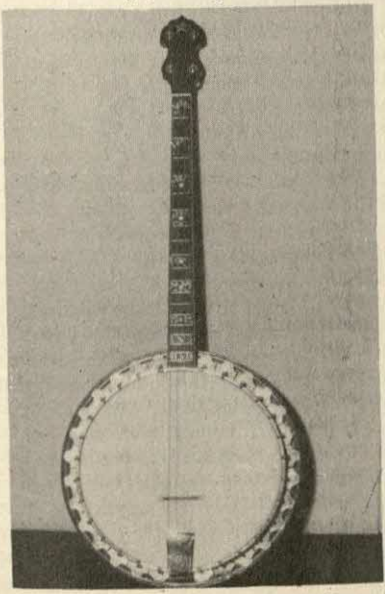
Bang's Disease. See *Brucellosis.*

Bangs (*băngz*), JOHN KENDRICK, author, born at Yonkers, N.Y., May 27, 1865; died Jan. 21, 1922. He was graduated from Columbia Coll. in 1883 and subsequently studied law. In 1884 he took up editorial work, contributing to *Harper's Magazine*, of which he became editor in 1899. Many of his writings are humorous and some have been dramatized. His chief books are: "The Water Ghost," "Tiddledywinks Tales," "Coffee and Repartee," "Three Weeks in Politics," "A Rebellious Heroine," "Mr. Bonaparte of Corsica," "Uncle Sam, Trustee," "A Houseboat on the Styx," "Mollie and the Unwise Man," "The Enchanted Typewriter," "Over the Plum Pudding," "Ghosts I Have Met," "The Mantelpiece Minstrels," and "Peeps at People."

Bangweulu (*băng-wê-ōō'lōō*), or BEMBA, a large lake in Africa, in the northern part of Rhodesia. The length from north to south is 150 m. and the width is about 75 m. It has an elevation of 4,000 ft. above the sea. The Chambezi flows into it from the east, and it discharges a part of the year by the Luapula. Several small islands within the lake are inhabited by natives. The lake was discovered by Livingstone in 1868 and by Stanley in 1876.

Banim (*bä'nĭm*), JOHN, novelist, born at Kilkenny, Ireland, Apr. 3, 1798; died Aug. 13, 1842. He took up a literary career at an early age. His chief books include: "The Battle of the Boyne," "The Smuggler," "The Mayor of Windgap," and a drama "Damon and Pythias."

Banjo (*băn'jô*), a musical instrument with four to nine strings, having a head similar to a tambourine and resembling a guitar. It is played by striking or twitching the strings with the fingers of the right hand. Joel Walker Sweeney (1813-60), an American musician, improved the instrument used in a crude form on Southern plantations.

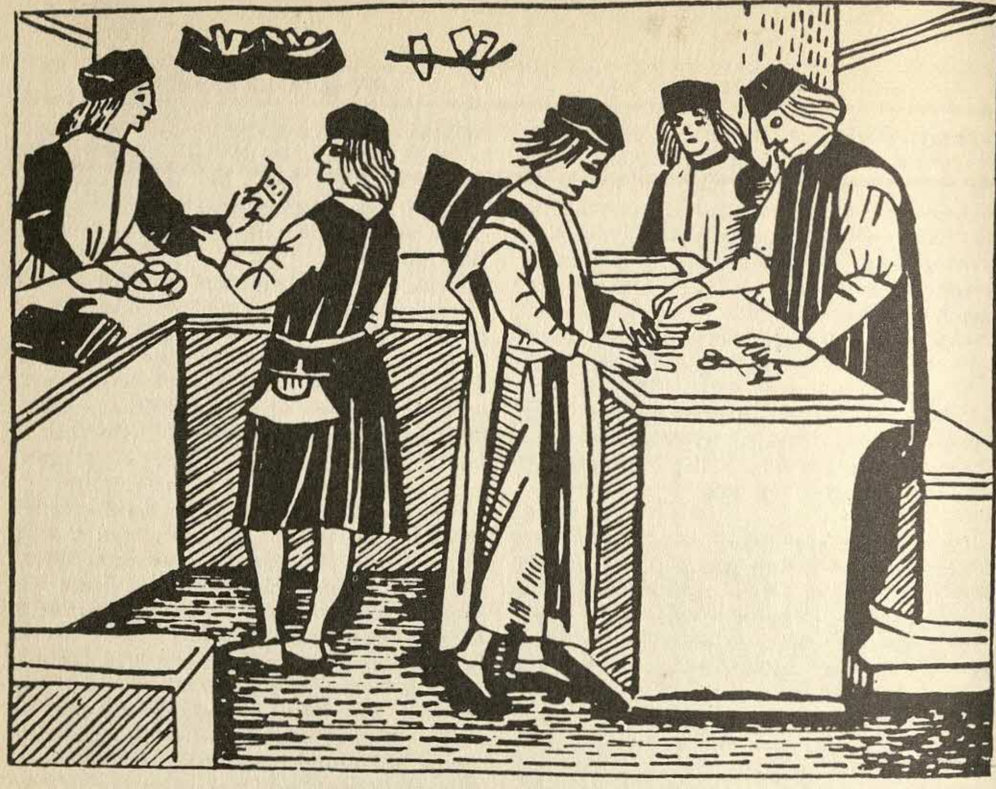


Courtesy Brown Bros., N. Y.

FOUR-STRING BANJO

Bank and Banking (*bănḳ and bănḳ'ing*). In a broad sense, a bank is a public, incorporated, or private business institution devoted to the handling of money, that is, legal tender (coins, paper money) as well as "credit money." Banking comprises the functions related to a bank, *e.g.* custody of savings, collection of bills and drafts, loan of funds, granting of credit, dealing in securities, issuing notes; it is a part of applied economics.

HISTORY. As early as 2000 B.C. the Babylonian temples instituted banking procedures, making loans on crops and deposits, or acting as buying agents for clients. This ecclesiastical system was imported to Egypt, and only after a long interval were private bankers in both countries able to break the monopoly of the priests. Records of the Igibi bank show that by about 575 B.C. private initiative had taken the lead in Babylon. In Greece the individual banker was powerless against the financial supremacy of the temples (Delphi, Ephesus) and, later, of the state. Unlike the Greeks, the Romans did not organize state banks. After a period of banking by the clergy of certain temples, such as the College of the Flamens, they entrusted private merchants with similar duties (around 200 B.C.), assigning them the Forum in which to execute their business transactions. In Hellenistic Egypt (3rd century B.C.) competitive state and private banks were co-existent. During the Dark Ages, banking was to all purposes eclipsed. When the Middle Ages again brought some measure of commercial security, banking history repeated itself. Once more the clergy engaged in financial operations. The Church, which condemned the taking of interest as a sin, became the trustee of deposits which could either be withdrawn or paid out as an annual income, thus initiating both insurance and the first negotiable paper in the form of the receipts calling for periodic reimbursement. Still another branch of modern banking can be traced to an ecclesiastical order. The Templars (*ca.* 1118-1320) developed the "trust company" in addition to dealing in other branches of banking. Slowly, forced by necessity, private banking, under municipal supervision, was revived (San Giorgio, 1148; Venice, 1157; Genoa, 1407). The banking house of Fugger (*q.v.*), flourishing in princely prosperity (15th and 16th centuries), financed emperors and nations with methods comparable to those employed today, but not until about 1700 did the current conception of banking take shape. One of the distinctive innovations was the spread of bank credit by use of bank notes and negotiable



Courtesy Bettmann Archive

ITALIAN BANKING HOUSE

From a 15th-century woodcut

instruments, especially checks. In medieval times, a depositor wanting to transfer a sum had to appear at the bank together with the payee, an irksome procedure which was avoided by payment in promissory notes either issued by a bank and payable to bearer on demand (bank note) or drawn on a banker by his creditor and payable to bearer at maturity (check). Now, protected by promissory notes, the banks of the 18th century began extending credit to personally trustworthy customers; to cover part of the risk involved they deducted from the amount of the note a certain per cent (discount), and often asked for some deposit in specie. In addition discountable notes of hand or bills occasionally induced the debtor of a long-term credit to give security by mortgage.

The Bank of England (*q.v.*) a few years after its foundation (1694) virtually monopolized the issue of bank notes thus causing the downfall of many a private banker who had maintained the money-changing and deposit tradition of the London goldsmiths, whose vouchers, payable on demand, were circulated and, in a rather primitive way, anticipated the bank note system. The privilege of issue was extended to the Bank of Scotland in 1695, to the Bank of Ireland in 1783, to branches of the Bank of France in 1800. By this time banking, in the modern sense of the word, had come of age, at least in Europe where banks, organized as government institutions or under corporations of merchants, filled the need for short-term credits by loaning on the security of merchandise.

In the U.S. the colonial period offered little stimulation to banking, and the collapse of the continental paper currency in 1781 led to conservative practice in granting special charters. However, Congress granted a charter, also permitting the issue of notes, to the first bank of the country, the Bank of North America, on Dec. 31, 1781, likewise allowing the establishment of the Banks of New York and Massachusetts in 1784. A new Congress, elected under the Constitution, furthered the economic development by chartering the First Bank of the U.S. on Feb. 25, 1791. With eight branches covering the nation from Boston to New Orleans, with headquarters in Philadelphia, Pa., this institution soon exerted a predominant influence over other banks of less capital, including the state banks, also regulating their note issues. Until 1811, when the charter expired, it acted as fiscal agent. Congress, under steady pressure on the part of the state banks, refused to renew the charter but in 1816, feeling the necessity of a regulative institution, Congress chartered the Second Bank of the U.S., thus securing effective banking service to government and country. After the War of 1812, the demand for bank credit rapidly increased. With the opening-up of natural resources and the expansion of manufactures and transportation, banks of all kinds mushroomed. There were 713 state banks by 1836. But their opposition to the U.S. Bank, in which they were championed by President Jackson in 1830, when rechartering was proposed, finally crippled the bank, which had received a charter from the State of Pennsylvania, and it went down in the economic crash of 1837. The general crisis, fomented by state bank loans and discounts out of proportion to deposits, and hastened by the mammoth cotton crop in 1836 and a consequent price tumble, deranged business, and many banks failed. Due to Federal and state bankruptcy legislation the panic gradually subsided. By 1843 the credit mechanism approached full recovery. Additional measures, such as the New York safety-fund system and other security plans helped regain the faith of the people in the banks. Neither the short-lived depression of 1857, which was followed by a suspension of payments in specie, nor the flooding of the country with counterfeit and altered bills could shake public confidence. So the proposal, actuated by the large credits which the Civil War (1861-65) made necessary, to permit the banks to organize under a national law and issue notes on the basis of bonds to be deposited with an officer of the government, was approved and eventually enacted in June 1864. Under this act the Federal Government set up a national banking system headed by a bureau in the Treasury Department. Technically the most important feature of the Act was that it provided for a uniform bank note of equal value in every part of the country, regardless of the place of issue, and so engraved that counterfeits could easily be ascertained. Regulations as to minimum capital required for the establishment of a bank, and a minimum percentage of paid-in values before the bank could commence business, rules on compulsory investments in U.S. bonds, the amount of bank notes and currency to be issued and the redemption of the notes, the building-up and maintaining of reserves, the liability of the stockholder for deposits, etc., evidenced the will to handle the economic life of the people on solid ground and enable the banks to cope with unavoidable emergencies due to nation-wide financial strain in cases of overproduction, failure of crops, etc. Despite the elastic arrangement for safety the system was comparatively slow in getting into operation. Early in 1865 only about 650 banks had organized under the national law. The fact that the requirements of the states were less exacting and, especially, that their laws permitted chartered institutions to enlarge their field of regular banking by fiduciary functions, induced many a bank to ignore the high yield to be secured from the market of government bonds. To stimulate the nationalization process, in March 1865 a prohibitive tax of 10 per cent was imposed on the note issues of state banks, with the result that in October 1866 national banks numbered 1,644. In 1870 there were but 325 state banks as against 1,622 national banks; by 1924 the proportion was about 19,000 state banks to 8,100 national banks. Since the 1930's more or less numerical equality has developed. In 1875 restrictions upon the aggregate amount of banknote issues was removed. The gold standard currency law of Mar. 14, 1900, permitted the issue of notes to the par value of the bonds deposited, instead of 90 per cent of the par value as laid down in the original act of 1864, and halved the minimum capital of $50,000 as well as the minimum population of 6,000 for the establishment of a national bank, thus favoring the extension of the national banking system to small communities.

The next great step was the adoption of the Federal Reserve Act on Dec. 23, 1913. It brought about a radical change in the banking organization of the U.S. After the crisis the mere "reforms" would not prove satisfactory. All the reforms undertaken since the panic of 1893—the repeal of the Silver Purchase Law, the Currency Act, "Aldrich-Vreeland Act" (1908) providing for emergency circulation not to exceed $500,000,000—were primarily concerned with the monetary predicaments of the country. As those causes were absent in the 1907 tribulation of business, attention was drawn to the lack of an effective coordinating agency, such as the central banks of Europe, and the conviction grew that a central banking organization would be the best remedy. An inquiry conducted into the so-called money trust in 1912 by a committee of the House of Representatives corroborated the general belief, banking revision measures were prepared, and a reorganization bill, drafted by Rep. Carter Glass of Virginia, was submitted to Woodrow Wilson, just elected President, for tentative approval (Nov. 1912). Immediately after his inauguration the new Congress enacted the law which created a system of 12 Federal Reserve Banks authorized to issue bank-notes under credit-favoring conditions and responsible, as virtual central banks, for the maintenance of the monetary standard. Being banks of rediscount as well as issue they function as bankers' banks, receive deposits from and make loans to them, also receive and collect checks. Although privately owned, they are controlled by a Board of Governors, a government supervisory body, and operate as fiscal agents of the U.S. (see *Federal Reserve System*). Under particular provisions of the law of 1913 national banks are authorized to create outstanding time liabilities by accepting bills; to lend though not unconditionally, 25 per cent of their capital and surplus upon real estate security in the interest of the farmers;

Courtesy Bettmann Archive

BANK OF CALIFORNIA IN THE 1870's

to establish foreign branches; to assume and exercise fiduciary functions which before were monopolized by the local trust companies. The constitutionality of trespassing into trusteeship was affirmed by the Supreme Court in 1916, while the trust companies were granted privileges enabling them to compete with the national banks. Another provision of the Act of 1913 allowed the national banks to sell their government bonds at par at the rate of not more than $25,000,000 worth per annum to the Federal Reserve Banks. By the requirement that national banks become members of a Federal Reserve Bank, subscribe for its stock and deposit part of their reserve with it, the law works for harmonization of differences between divergent interests, national and local as well as governmental and private, and makes for stabilization of the economics of the country. Several amendments enacted after 1913 did not alter the basic structure of the law, with the exception that the national banks were obliged to transfer their entire reserves to a Federal Reserve Bank.

The system began to operate legally on Nov. 2, 1914. Due to European war purchases there was a heavy flow of gold into the U.S. This fact made for greater independence of the member banks and expansion of credit, first in the interest of American industry, later, after the entry of this country into the war (1917), on behalf of the financial needs of the government (Liberty Bonds, Victory Loans). The inflationary "boom" after the war, followed by a serious depression and renewed flow of gold from Europe, where some currencies approached the vanishing point, compelled the system to deviate from orthodox precedents in its policy and advance an enormous amount of credit. The aftermath of "prosperity" was the collapse of property, commodity and security values between 1929 and 1932, accompanied by the heavy withdrawal of deposits, the forced liquidation of bank credit, the failure of many banks. A bank holiday on Mar. 4, 1933, and an emergency banking act, passed a few days later (Mar. 9) made it possible for all "sound" banks (about 14,000 in number) to reopen. During this period the system pumped ample funds into the banks through market operations and the maintenance of very low discount rates. Legal measures, such as the Glass-Steagall Banking Act of June 16, 1933 (based partly on the McFadden Act of Feb. 27, 1927, and revised by the Banking Act of 1935), provided, by limiting the activities of national banks, for the return to a more prudent credit policy and general safety. In 1935 the insurance of all deposit accounts up to $5,000 was established.

At the time the U.S. entered World War II (Dec. 1941), the Federal Reserve System was prepared to use its powers for financing the war effort and fighting inflationary tendencies. It financed the war expenditures chiefly by increased sales of government securities to non-bank investors, thus supplementing the nation's revenues from income taxes, and it raised war funds as far as possible from investors other than banks, thus closing to a degree, the "inflationary gap" created by excess income. As a fiscal agent it cooperated with the Treasury by consulting on financial policies and programs of any kind, including gold standard, foreign markets, conversion of the war economy to a peace economy, and aid programs to foreign countries.

Classification. Modern economists will not recognize any "theory of banking" based on allegedly exact demarcation lines between the various groups of banks and their functions. There was a time when "discount, deposit, and issue" meant a real triptych of bank operations. Increasingly the most diversified transactions are handled by a single institution. Yet a grouping on the basis of organization, prevalent functions, legal sources, or privileges constituting a hierarchy of banks is feasible. As to privilege, the right of issuing notes assigns to a bank so favored a dominant role in national economy. In most foreign countries the "banks of issue" are centralized (Bank of England, Bank of France, Bank of Canada, Reserve Bank of India, etc.) while in the U.S. 12 Federal Reserve banks of issue, each serving a different section of the country, are combined in the Federal Reserve System. As to prevalent functions, a distinction has been proffered between "commercial banks," engaged in dealing in short-term credit, and "investment banks" gathering funds for the creation of capital-producing income. The "clearing house" settles obligations between banks, a function exercised in the U.S. by each Federal Reserve bank for its members.

As to legal origin, the American scheme which resembles that abroad, except for the unique Federal and state machinery of the U.S., will best serve as a model. There we find in addition to the Federal System and their members, the national banks, which are vested with the right of issue and full banking powers of the commercial sort; state banks, chartered by the several states and organized for any commercial purpose under banking laws; "Federal Land Banks," to make long-term first mortgage loans on farm real estate security through local national farm loan associations (Federal Farm Loan Act of 1916); trust companies which often practice commercial banking, too; mutual savings banks, chartered in a few states, without capital stock but with a guarantee fund collected out of the earnings beyond that which is paid as dividends to the depositors; savings (or building) and loan associations, cooperative banks, patterned after the English building societies, which provide a safe place for investment of funds especially in the interest of debt-free home ownership. Another type of institution known as savings bank and trust company, as well as many commercial banks, accept savings deposits for any purpose. Home loan banks, created by the Home Loan Bank Act of July 22, 1932, or U.S. thrift and home-financing institutions and labor (savings) banks, chartered under state or Federal laws, controlled by labor, and operated by trade-union officials with the help of bankers also accept savings. Postal savings banks, established by Act of Congress in 1910 and operated by the U.S. Post Office Department encourage small savings. Finally, private banks, usually partnerships under the general banking law of a state, accept deposits, or as banks of discount confine their activities largely to discounting commercial paper, acceptances, and bills of exchange, and, as acceptance banks, primarily accept bills drawn by their customers selling them in the open market.

In Great Britain "exchange banks" specialize in foreign exchange and international trade, and mortgage banks which both in England and the U.S. are rather investment or finance companies, raise money by the issue of shares or debentures and lend it on mortgage to agriculturists. As to organization, a bank may be restricted to a certain locale or may do business over a wide area through branches. The English exchange bank, for instance, has branches in many countries. The Federal Reserve System maintains over 23 "direct settling" branches providing better facilities for its service. Neither a commercial nor an investment bank, but a specific institution set up to accommodate commerce and business with regard to the general credit situation of the U.S. is the Federal Open Market Committee. The operations conducted by the committee, which forms a section of the Federal Reserve System, consist of the purchase and sale in the open market of obligations of the U.S., certain other securities, and bills of exchange and bankers' acceptances of the kinds and maturities eligible for discount by the Reserve Banks.

Statistics. The total number of banks (head offices) in the U.S. is about 14,700. Commercial banks number about 14,150 (of which total *ca.* 6,900 were Federal Reserve Bank members, *e.g.*, national and state banks, *ca.* 7,300 non-member banks); mutual savings banks, 530. There are about 130 private banks.

Operations. Contemporary banking circles around credit. The safeguarding of money, securities, deeds, jewelry, etc., does not constitute a banking transaction, although a bank may be willing to take such values into its custody. Nor is the reception of money for the purpose of investment anything but a subsidiary function of a bank which, in that case, acts as a trustee. Only when the bank is given power to work with the people's money under no obligation to return the original coins or bills, or to account in detail for everything it has done with it, is an act of banking performed. Instead of being set apart and returned later untouched, money received for safekeeping is converted into a debt due from the bank to be repaid in accordance with the contract. The customer is "credited" in the books.

"Instruments of credit," such as checks, are issued with which a customer can order the bank to pay a certain amount to a creditor. The collecting of checks or other debts, such as coupons and negotiable paper (bills of exchange, promissory notes) is also a banking operation. Economically, however, the most important credit function of the banks is in creating credit. When a bank discounts a bill and, especially, grants an advance, the debt of the bank to the trader, credit money, becomes a means of payment which adds to the means before available in the community and will, if used for purposes of production, contribute much to the economic growth of the nation. Obviously, there are limits to the scope of credit a bank can create. The cash holdings of the bank cannot be reduced beyond an adequate sum without endangering its liquidity. If deposit liabilities are on the increase, the bank needs a proportional ratio in cash. Moreover, the bank is compelled, both by the law and a reasonable credit policy, to provide for losses by the accumulation of a reserve or surplus out of profits, of a guarantee fund, which will help to maintain a sufficient margin of total assets over total liabilities. See *Savings Bank.*

Bank for International Settlements, organized at Basel, Switzerland, in 1930, in accordance with the Young Plan for the purpose of dealing with German reparations payments of World War I. This bank, sometimes referred to as the *World Bank,* was also projected to serve as a clearing house for the settlement of international transactions to eliminate the necessity of shipping gold. The U.S. has no official connection with the bank due to the fact that it did not ratify the Treaty of Versailles. See also *International Bank for Reconstruction and Development; International Monetary Fund.*

Bankhead (*bănk'hĕd*), TALLULAH, actress, born in Huntsville, Ala., Jan. 31, 1903, daughter of the Congressman from Alabama, William B. Bankhead (1874-1940). She made her debut at the Greenwich Theater, New York City, in "Squab Farm" (1919). Her first stage successes were in London (1923-31). Returning to the U.S. in 1931, she appeared in films, which were not too successful. Then returning to the stage, she starred in many Broadway plays, including "Forsaking All Others" (1933), "Reflected Glory" (1936), and "The Little Foxes" (1939). She has also made television appearances and published an autobiography, "Tallulah" (1952)

Bank Holiday, a day on which general operations of banking and payment of negotiable notes are suspended. In the U.S. bank holidays generally coincide with legal holidays, such as Sundays, New Year's Day, Good Friday, Independence Day, Labor Day, Election Day, Armistice Day, Thanksgiving Day, and Christmas Day. Some states have passed laws permitting Saturday closings. The term, however, has become associated with the few days following Mar. 6, 1933, when all banks in the country were ordered closed by Presidential Proclamation to prevent panicky withdrawal of deposits and to prepare for the reorganization of banks provided for by legislation under Congressional deliberation at that time. See *Bank and Banking.*

Photo Vandamm Studio, N. Y.; courtesy WOR

TALLULAH BANKHEAD

Bank Notes, promissory notes or bills issued by an authorized bank and payable on demand. In the U.S. the following notes are circulating as currency: *Silver certificates, Treasury notes of 1890, U.S. notes, Federal Reserve notes, Federal Reserve bank notes* and *National bank notes. State bank* notes were taxed out of existence in 1865 *Gold certificates* were withdrawn from circulation in 1933. The law designates *silver certificates* and Treasury notes as *legal tender* or *lawful money* in that it authorizes a debtor to tender and a creditor to receive such notes in payment for money obligations. Silver certificates and bank notes are issued in the following denominations with portraits engraved on them: $1 (Washington), $2 (Jefferson), $5 (Lincoln), $10 (Hamilton), $20 (Jackson), $50 (Grant), $100 (Franklin), $500 (McKinley), $1,000 (Cleveland), $5,000 (Madison), and $10,000 (Chase).

Bank of England, organized in 1694 as a joint-stock association authorized to issue notes in exchange for the loan of its entire capital to the government. Under the renewed charter of 1844, the bank was reorganized and its functions divided into an issue department for the release of bank notes, and a banking department for such

Courtesy Brown Bros., N. Y.

BANK OF ENGLAND IN THE 1890's

operations as distinguish it from other banks in that it acts as the banker's bank—holding all gold reserves and the deposits belonging to the government, and assisting the government in the collection of public revenues. In 1946 the Bank of England was nationalized, bringing its capital stock under public ownership and control. The Bank was given power to enforce its recommendations to commercial banks, thus making possible a certain degree of public control over the banks of the country.

Bank Rate, a rate of discount charged by state banks, as opposed to the rate in the open market. The bank rate in England is fixed by the Bank of England, in the U.S. by the Federal Reserve Bank. The rate fluctuates.

Bankruptcy (*bănk'rŭpt-sȳ*), in the U.S. the status of an individual, partnership, or company which has been adjudicated bankrupt by the court because of insolvency or written admission of insufficient property to pay debts. The object of bankruptcy proceedings, which may be instituted either voluntarily by the debtor or against his will by his creditors, is to divide equitably among the creditors the debtor's assets and discharge the debtor from all remaining debts. In case of fraud the discharge may be denied by the court; political disability in no case results from failure in business. The first Federal bankruptcy law was enacted in 1800 and repealed in 1803. Then followed laws in 1841 (repealed in 1843), 1867 (amended in 1874, repealed in 1878), 1898 (amended several times, last by the law now in force, which took effect on Sept. 22, 1938). The procedure is similar in principle all the world over. Some European states allow, under particular regulations, a private compromise instead of, or in addition to, court proceedings. See *Securities and Exchange Commission.*

Banks (*bănks*), SIR JOSEPH, naturalist, born in London, Feb. 13, 1743; died in Islesworth, June 19, 1820. After studying botany at Christ Church, in Oxford, he carried out scientific expeditions to Newfoundland, Labrador, and Iceland. Outfitting the *Endeavour* at his own expense, he accompanied Capt. Cook (*q.v.*) on his expedition round the world (1768-71), serving as naturalist and writing the botanical report of the voyage. He also wrote "A Short Account of the Causes of the Blight, the Mildew, and the Rust in Corn" (1805), and from 1777 until his death was president of the Royal Society in London.

Banks, NATHANIEL PRENTICE, soldier and statesman, born at Waltham, Mass., Jan. 30, 1816; died Sept. 1, 1894. He received a common school education, worked in a cotton factory, and became a lawyer. Though a Democrat, he supported the principles of the Know Nothing party and held the view that the Democrats and the Republicans should form a coalition. He was elected to Congress as a Democrat in 1852 and re-elected by the Know Nothing Party in 1854, and during his term served as Speaker of the House. In 1857 he became governor of Massachusetts, and when the Civil War broke out he was placed in command of an army corps on the Potomac. He succeeded Gen. Butler in command of the Department of the Gulf in 1862. In 1863 he opened the Mississippi by capturing Port Hudson with 6,000 prisoners. He commanded the Red River Expedition in 1864, but was forced by Gen. Richard Taylor to make a retreat. Soon after he was relieved of his command and resigned. He served in Congress from 1864-77, except in 1872, and was again elected in 1888. For many years chairman of the Committee on Foreign Relations, he exercised a wide influence in national legislation.

Banks, THOMAS, sculptor, born at Lambeth, England, Dec. 29, 1735; died Feb. 2, 1805. In 1770 he received a gold medal at the Royal Acad., and subsequently studied sculpture in Rome. He visited Russia in 1781, where he made a group called "Armed Neutrality" for Catherine II. Among his other works of note is "Shakespeare Attended by Painting and Poetry" at Stratford-on-Avon.

Banner (*băn'ẽr*), a flag or standard carried at the head of a group, either in a general parade or for military purposes. Its use is to indicate the line of march, or the rallying point in war, in attack or retreat. Banners are made of bunting or a good grade of cloth. See also *Flag.*

Banning (*băn'ĭng*), MARGARET CULKIN, novelist and lecturer, born Mar. 18, 1891, Buffalo, Minn. The year after her graduation from Vassar Coll. (1912) she was made a research fellow of the Russell Sage Foundation. In 1914, she was appointed trustee of Vassar Coll., the St. Paul Inst. of Science, and the Duluth public library. Since then she has become widely known as a novelist,

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MARGARET CULKIN BANNING

Courtesy N. Y. Academy of Medicine

SIR FREDERICK BANTING

and as a lecturer and writer on social problems, such as sex-enlightenment for the young and adjustment difficulties under modern social conditions. Her fearless and honest approach to these and other controversial subjects has won respect for her views and admiration for her courage. She has traveled a great deal and written many short stories and serials as well as novels. Several of these have been adapted for motion picture use, and a typical list of novels would include "Half Loaves" (1921), "Spellbinders" (1922), "Pressure" (1927), "Mixed Marriage" (1930), "The Iron Will" (1935), "Enough to Live On" (1941), and many others. During the war years she produced three more serious works, "Salud: A South American Journal," which appeared in 1941, followed by "Women for Defense" (1942), and "Letters From England, Summer 1942" (1943).

Bannockburn (*băn'ŭḳ-bûrn*), a village in Scotland, 2 m. S.E. of Stirling, on the Bannock Rivulet. It is famous for a decisive battle, in 1314, between King Robert Bruce of Scotland with 30,000 men and Edward II of England with 100,000. The latter was defeated with a loss of 30,000 men.

Bantam Fowl (*băn'tạm*), a small domestic fowl that derived its name from Bantam, in Java. A well-bred bantam does not weigh over a pound when full grown.

Banting (*băn'tĭng*), SIR FREDERICK GRANT, research physician, born in 1891 at Alliston, Ont., Canada; died in 1941 in Newfoundland in a plane crash. For his part in discovering insulin, extensively used in the treatment of diabetes, he shared the Nobel Prize for physiology and medicine (1923) with Drs. C.H. Best and J.J.R. McLeod.

He received his medical degree from Toronto Univ. (1916), and was appointed professor of medical research there in 1923. He was awarded the Scott Medal (1924) as well as other medical honors.

Banxring (*bănḳs'rĭng*), an insectivorous animal native to India and the East Indies. It has an elongated muzzle and a bushy tail. It is active and spry and spends much of its time in climbing the limbs of trees, resembling in this respect the lemurs and squirrels.

Banyan (*băn'yạn*), or BANIAN, a tree native to the East Indies, Ceylon, and Australasia, and remarkable for its branches and roots. Every branch of the main tree throws out its own roots, which become parent trees and throw out other branches. The wood is light and of little value, but the tree yields lac and the bark possesses a tonic property useful in treating diabetes. This tree lives many years and often covers large areas. One in India furnished shelter for 7,000 men, while another found in Australia covered nearly seven acres. A tree in India, known by the name *cubbeer burr*, has 350 large trunks and over 3,000 smaller ones. In these trees dwell large numbers of birds and monkeys, which are fond of their fruit, a kind of fig. The tree is held sacred by the Brahmans.

Baobab (*bä'ô-băb*), a tree native to tropical Africa, and met with in Senegal, Abyssinia, and the region of the African lakes. The trunk grows to a height of from 60 to 70 ft., and the growth of its limbs presses outward about the same distance, making the diameter in many cases 150 ft. In the larger trees the roots are sometimes over 100 ft. in length. The leaves are large and abundant and of a dark green color, and the large flower is white and has beautiful snowy petals. The fruit is a soft pulpy but dry substance, about the size of a quart flask, inclosed in a long dull-green woody pod. Between the seeds is a pulp which tastes like cream of tartar, and is used by the natives to give flavor to their porridge. The wood is soft and light, and when decay sets in the woodish structure becomes porous and finally falls to pieces. Cloth and rope are made of the fiber, and the juice of the fruit is used as a drink, but the wood is not particularly valuable. It was discovered by Michael Adanson and is sometimes called *adansonia*. Livingstone reported that one of the trees seen by him was at least 1,400 years old.

Baptism (*băp'tĭz'm*), a name derived from a Greek word which means to dip or wash, and is applied to a rite of many churches. The rite of baptism is administered by immersing in water, or by sprinkling or pouring water upon the person, and signifies purification or spiritual burial and resurrection with Christ or a union with Christ as our Saviour and Lord. Early in the history of the Christian Church it was held that the two outward essentials of baptism are the use of water and the words of Christ as given in Matt. 28:19. It is probable that immersion was the exclusive form used in the primitive church, which later became a trine immersion in respect to the Trinity. At that time sprinkling or clinical baptism, as it was called, was confined to the sick and aged. The Greek Catholic and a number of Protestant denominations practice immersion, while the Roman Catholic and most Protestants sprinkle or pour the water upon the head.

Baptists (*băp'tĭsts*), one of the largest of the Protestant church groups. Its name derives from the faith's belief that baptism by immersion is the method indicated in the New Testament. Differences of opinion over the importance of this interpretation have caused divisions of this group into various sects over a period of several centuries, however.

Baptists have existed in fairly large numbers since New Testament times but the first fully organized Baptist church was founded in Leyden, Holland (1611), by the Rev. Joseph Smyth and Thomas Helwys, who later organized such churches in England, placing strong emphasis on religious liberty.

The earliest recorded Baptist churches in America were those established in Providence and Newport, R.I., by Roger Williams and Dr. John Clarke, respectively, in 1638. Both churches are still in existence. There are also definite traces of Baptists in Virginia as early as 1607 and it is known beyond doubt that the struggle for religious liberty of the Rhode Island Baptists during the early 17th century was matched by those in Virginia and the other colonies. George Washington, Thomas Jefferson, and James Madison, all Virginians and all Presidents of the U.S., acknowledged their indebtedness to the earlier Virginia Baptists for their struggle for independence and it is well known that the preachings of Southern Baptists and other Protestant groups influenced to some degree the passage of the Bill of Rights of the U.S. Constitution.

The Baptists of the world number about 14,000,000 at present, with nearly 12,000,000 of these in the U.S. and Canada, and several hundred thousand in Mexico, the West Indies, and South America. In the U.S., the most prominent Baptist groups are the Northern, Southern, and two Negro groups of which the largest is the Southern Baptist Convention numbering between 5,000,000 and 6,000,000 members. There are also about 16 small sects based on divergent doctrines and practices. The larger American groups are strongly organized for home and foreign mission projects, and sponsor a number of educational, charitable and social service projects including universities, schools, hospitals and summer camps and assemblies. They have large publishing houses and issue regularly a vast number of books and periodicals. Their financial assets, including church properties, exceed $400,000,000, and their annual donations for all religious, charitable, and educational interests exceed $50,000,000 annually.

The total Baptist fellowship in America is loosely organized, with those of Europe, Asia, Africa, and Australia, in the Baptist World Alliance. The three major American Baptist groups are incorporated as are most of their societies, boards, and state organizations but there is no source of ecclesiastical authority other than the local church. The Northern Baptists are affiliated with the Federal Council of Churches of Christ in America (*q.v.*) and with the World Council of Churches (*q.v.*).

Barabbas (*bȧ-răb'ạs*), a "notable prisoner," in prison at the same time as Jesus. His release, demanded by the elders in preference to the release of Christ, was granted by Pilate (Matthew, 27:16-27; Mark, 15:7-15; Luke, 23:18).

Baraboo (*bâr'ȧ-bōō*), the county seat of Sauk County, Wisconsin, 35 m. N.W. of Madison, on the Baraboo River, and on the Chicago & Northwestern R.R. It is surrounded by an iron, fruit, and grain producing country. The city's principal industries are dairying, linen and woolen products, refrigerators, and machinery. Baraboo was incorporated in 1882. Population, 1920, 5,538; in 1940, 6,415; in 1950, 7,264.

Barany (*bă'rạn-y̆*), ROBERT, physician, born in Vienna, Austria, Apr. 22, 1876; died Apr. 8, 1936. After practicing medicine in various German clinics, he was made an assistant in the Vienna Univ. ear clinic, and became a lecturer on diseases of the ear in 1909. During World War I he served as a military physician, and in 1917 was made head of the eye, ear, nose and throat clinic of Upsala Univ. (Sweden). Barany's most important work concerned the vestibula apparatus of the ear. His discovery of the caloric reaction of the inner ear provided the first test for this organ. He carried his research into the equilibrium centers of the cerebellum and his work led to the development of tests which differentiate between dizziness caused by disease of the ear and that caused by disease of the brain. In 1914, Barany was awarded the Nobel Prize for Medicine and Physiology.

Barbados (*bär-bā'dōz*), the most easterly island in the West Indies, a colony of Great Britain, situated east of the Windward Islands. Surrounded by coral reefs, it has an area of 166 sq. m., and its hills culminate in Mt. Hillaby (1,105 ft.). Highly fertile, it produces chiefly cane sugar (which, with rum and molasses, is exported), cotton, and local food crops, such as corn and yams. Bridgetown (pop., *ca.* 18,000) is the capital. Settled by Britain in 1627, the densely populated island has remained continuously British. In 1958 it became a member of The West Indies. Population, 1958, *ca.* 229,500.

Barbarian (*bär-bâr'ĭ-ạn*), a term originated by the ancient Greeks, who called all foreigners and those unable to speak their language barbarians. According to Plato there were but two classes in the human family, the Greeks and the barbarians. The term was not used originally in reproach, but after the Persian invasion it implied hostility to the Greeks and their civilization. After the Roman conquest of Greece, the word *barbarian* was used in reference to all nations except the Greeks and Romans.

Barbarossa (*bär-bȧ-rŏs'ȧ*), meaning Red Beard, a surname applied to Frederick I of Germany. See *Frederick I.*

Barbarossa, the name of two famous brothers, born in Greece, who became Turkish pirates. They established themselves in Algiers and ravished the shores of the Mediterranean. The oldest, named Aruch, was captured and beheaded in 1518; the youngest, named Hayraddin, conquered Tunis for Turkey. He died in 1546.

Barbary (*bär'bȧ-rĭ*), a name sometimes applied to the northern portion of Africa, which includes Fez, Morocco, Tunis, Barca, Fezzan, and Algeria. The name was taken from the original inhabitants known as Berbers, who were conquered by the Arabs in the reign of the caliphs. The country was prosperous in the time of the Carthaginians, and, next to Egypt, it became the richest Roman province. In ancient times the district included Numidia, Mauritania, and Cyrenaica. It became infested with pirates in the 15th century, and was finally civilized after the conquest of Algeria by the French. At present it is inhabited by Berbers, Turks, Bedouins, Jews, Negroes, and French.

Barbary Ape, OR MAGOT, a small tailless ape found in Northern Africa. It walks on four feet and is skillful in passing from tree to tree. The color is greenish-gray and in size it is not much larger than a cat. It is capable of being trained to perform tricks.

Barbecue (*bär'bē-ḳū*), a term derived from the natives of the West Indies, now applied to the practice of roasting an ox or other large animal at a social entertainment on a large scale. In the southern part of the U.S. the name has reference to a jollification, especially to a political jubilee.

Barbel (*bär'bẹl*), a fish of the carp family, of which species are found in the fresh waters of America and Europe. The common barbel of England is a game fish, but its flesh is coarse, and it measures from 2 to 3 ft. in length. The binny or barbel in the Nile weighs about 60 pounds and is esteemed for food. Several species closely resemble the American sucker, but all have soft barbels growing from the snout and upper jaw, hence the name.

Barber (*bär'bẽr*), a person whose business is to shave, trim, and cut hair. Formerly surgery was combined with the craft. In the time of Henry VII laws defined the duties of barbers, and forbade higher surgical operations than bloodletting and tooth pulling. Barber shops were noted as news centers in classic times and they are still notorious for gossip. In many countries, as in some of the states of the U.S., the practice of the barbers' art is limited by law to persons skilled by training, who are required to hold a certificate of qualification. A spirally decorated red and white pole has long been a sign of barbers' shops.

Barber, JOHN WARNER, engraver, author, born in Windsor, Conn., Feb. 2, 1798; died in New Haven, Conn., June 22, 1885. Apprenticed at 16 to a banknote engraver, Barber became independent in 1823. He used his engravings, in wood and copper, to illustrate books on religious and historical subjects. His most noted works were on American local history, compiled from information gathered from old settlers, etc., on long trips through the countryside. While the individual engravings were not memorable, the collections were very popular.

Barber of Seville (*sẹ-vĭl'*), THE, comic opera by the Italian composer, Gioacchino Rossini (*q.v.*), first performed in Rome, Italy, in 1816 and in the U.S. in 1819. The opera is a setting of the play by Pierre de Beaumarchais (*q.v.*).

Barber, SAMUEL, composer, born in West Chester, Pa., March 9, 1910. As a child, he was a musical prodigy. Trained in voice, piano, and composition at the Curtis Inst. in Philadelphia (1923-32), Barber became noted as a composer. He won three Pulitzer Prizes (1935, 1936, 1958), the Prix de Rome (1935), a Guggenheim award (1945), and the award of the Music Critics Circle (1946).

SAMUEL BARBER

Barber's "Symphony in One Movement" (1936) was the first American work to be performed at the Salzburg Festival (1937), and his "Adagio for Strings" and first "Essay for Orchestra" received their *premières* in 1938 as the first American compositions to be performed under Toscanini. Barber composed many songs, choral works, *e.g.,* "A Stopwatch and an Ordnance Map" (1940) and "Prayers of Kierkegaard" (1954), and the opera "Vanessa," to a libretto by Gian Carlo Menotti, first produced by the Metropolitan Opera Assn. in 1958. His other compositions include "Dover Beach" (1931) for voice and string quartet; his "Second Symphony" (1944); a cello concerto (1945); the score for Martha Graham's ballet "Cave of the Heart" (1946), the following year made into the suite "Medea"; and "Die Natali: Choral Preludes for Christmas" (1960).

Barberry (*bär′bĕr-rĭ*), one of a family (Berberidaceae) of herbs and shrubs, particularly the shrubs of the genus *Berberis.* They are found in all of the continents except Australia. Often grown as hedges, the barberries usually have spiny stems, yellow wood, and red berries; their yellow flowers appear in racemes (stalklike clusters). The shrubs may grow from 1 to 8 ft. high, with gray or brown bark. The common barberry (*Berberis vulgaris*) is one of the hosts to the wheat rust, and attempts have been made to eradicate it. The Japanese barberry (*Berberis thunbergii*) has small smooth-edged leaves, unlike the serrated leaves of other species, and is preferred in wheat-growing regions.

Barberton (*bär′bĕr-tŭn*), a city in northeastern Ohio, in Summit County, immediately southwest of Akron. Barberton is served by several railroads, including the Baltimore & Ohio and the Erie-Lackawanna R.R.'s. Manufactures of the city include chemicals, matches, metal products, porcelain, and rubber products. The city is a part of the Akron standard metropolitan statistical area, and had a value added by manufacture (1958) of $134,186,000. The site was laid out in 1891 and Barberton was incorporated as a city in 1892. Population, 1950, 27,820; in 1960, 33,805. See also *Akron, Ohio.*

Barberton, a town in the province of the Transvaal, Union of South Africa. It is located in the eastern central portion of the province, 136 m. by rail w. of Lourenço Marques, Mozambique. The town lies in the De Kaap valley, about 2,800 ft. above sea level. Barberton originated in the gold rush of the late 19th century, and it remains a mining center; it is also an agricultural marketing center, particularly for citrus fruits and cotton. Population, 1960, 11,016.

Barbary States (*bär′ba̤-rĭ stātz*). See *Tripolitan War.*

SIR JOHN BARBIROLLI

Barbirolli (*bär-bĭ-rŏl′ĭ*), SIR JOHN, musical conductor, born GIOVANNI BATTISTA BARBIROLLI, in London, England, Dec. 2, 1899, of Italian-French parents. A youthful talent for music won him a scholarship to the Royal Acad. of Music, and he made his debut at Queen's Hall in London in 1910 as a cellist. After World War I, he played the cello in the International String Quartet, then formed his own chamber orchestra. Among his posts, Barbirolli was a conductor of the Covent Garden Opera (1927-33) and led the New York Philharmonic-Symphony (1936-42) and the Hallé Orchestra of Manchester (1943-60). His appointment as chief conductor of the Houston Symphony was announced in 1960. Knighted in 1949, he won the gold medal of the Royal Philharmonic Society in 1950 and the Bruckner Medal of the Bruckner Society of America in 1959.

Barbiturate (*bär-bĭt′ūr-āt*), a collective name applied to a large group of drugs derived from or similar to the organic substance *barbituric acid.* These drugs are widely known and used by the medical profession as sedatives, hypnotics, anticonvulsants, and brief anesthetics in a variety of

BARCELONA. SPANISH NATIONAL PALACE

This structure, with its sweeping staircases, sculptures, and fountains, illustrates the Moorish tradition which permeates Spanish architecture. Like most buildings of 19th cent. Spain, it is characterized by decorative qualities rather than by artistic merit

preparations in the form of powders, tablets, and solutions. They are also widely known and frequently indiscriminately used by laymen as sedatives and sleep-inducing agents. The basic action of all barbiturates is depression of the brain and nervous system.

Barbuda (*bär-bōō'dȧ*), one of the Lesser Antilles, in the West Indies, 20 m. N. of Antigua. It is of coral formation and has an area of 60 sq. m. The surface is level and partly covered with forests, and cattle raising is the chief occupation. The island is a British possession. Population, 600.

Barbusse (*bär-bōōs'*), HENRI, writer, born in Asnières, France, May 17, 1874; died in 1935. Educated at Collège Rollin, he became a theater critic and wrote a volume of poems *"Pleureuses"* (1895), the novel *"Les suppliants"* (1903) and the tragedy *"L'Enfer"* (1908). He took part in World War I, and his fame rests on *"Le Feu"* (1917), the realistic story of a squadron during the war. He was awarded the Goncourt Prize for this book. After the war he served as a correspondent of the socialist paper, *"L'Humanité."* An ardent pacifist, he made many pleas for international socialism in his newspaper writing as well as in such works as *"Clarté," "Paroles d'un combattant," "Les bourreaux," "Jésus,"* and *"Les Judas de Jésus."* Several of his books were translated into English, among them, *"Le Feu,"* which appeared as "Under Fire."

Barca (*bär'ḳȧ*), a district located between Egypt and the Gulf of Sidra, belonging to the Turkish Republic. It is bounded on the north by the Mediterranean and south by the Libyan Desert. The surface is hilly and mountainous, being traversed by highlands which reach an altitude of 3,310 ft. Agriculture and cattle-raising are the chief industries. The exports are cattle, grain, ivory, and ostrich feathers. It was known to the Greeks as Pentapolis and contained five large Greek cities. The inhabitants consist mostly of nomadic Arabs and Berbers. Bengazi is the seat of government and the largest city. Population, 300,000.

Barcarolle (*bär'ḳȧ-rōl*), French, a song sung by the Italian, especially the Venetian, boatmen (*gondoliers*). The "Barcarolle" from Offenbach's opera, "The Tales of Hoffmann" (produced posthumously, Paris 1881), is especially known.

Barcelona (*bär-sē-lō'nȧ*), formerly the capital of the kingdom of Catalonia, and now an important city in a province of the same name. It is the principal seaport on the Mediterranean, has railroad connection with the chief towns of the Iberian Peninsula, and next to Madrid is the most flourishing city of Spain. It consists of two parts, the new and the old. The former is modern and is platted on a regular plan, while the latter is irregular and ancient. A promenade extends from the Columbus monument to the Plaza de Cataluña. The cathedral occupies an elevated site that was formerly the location of a Roman temple and a Moorish mosque. It has manufactures of cannon, paper, machinery, woolen and silk goods, chemicals, wines, and clothing. It is an important city of commerce and has a large import and export trade. It is the seat of a museum, an arsenal, a public library, a university, and other public institutions. The city was under the government of a line of counts until the 12th century, but in 1137 it became a part of the kingdom of Aragon. In 1640, it became French territory, but was made a part of Spain in 1652, and was retaken by the French in 1697. The Peace of Ryswick, in the same year, restored it to Spain. During the Spanish Civil War (1936-39), Barcelona, faithful to the republican sentiment of its inhabitants, withstood the heaviest land and air attacks of Gen. Franco's forces. It was finally captured Jan. 26, 1939, having been the temporary capital of the Republic since Nov. 1, 1937. Population, over 1,000,000.

Barcelona, a city in Venezuela, capital of the state of Anzoátequi, 150 m. E. of Carácas. It is situated on the Neveri River, 3 m. from its entrance into the Atlantic Ocean, and has railroad facilities and a good harbor. In the vicinity are coal and salt mines. Considerable trade is carried on in coal and fruit. A government house, the theater, and a number of educational institutions are located here. The first settlement was made at Barcelona in 1638, and in 1881 it became the capital of Bermúdez, which has been divided to form the two states of Sucre and Barcelona. Population, *ca.* 10,000.

Barclay (*bär'ķlâ*), ROBERT, an eminent Quaker, born in Gordonstown, Scotland, Dec. 23, 1648; died Oct. 3, 1690. He studied in his native town and in Paris, where he embraced the Catholic faith, but later became a Quaker. For several years he traveled with William Penn and George Fox through Holland, Germany, and England to spread the doctrine of the Quakers. His chief writings include: "Catechism and Confession of the Faith," "Treatise of Universal Love," and "Truth Cleared of Calumnies."

Barclay de Tolly (*bȧr-ķlā̆' dē̆ tô-lē̆'*), MICHAEL, PRINCE, soldier, born in Livonia, Russia, Dec. 16, 1761; died May 14, 1818. He entered a Russian regiment and fought against the Turks and Swedes, and took a prominent part in two invasions of Poland. In 1809 he had charge of an army and invaded Sweden with 10,000 men. The following year he was appointed minister of war, which office he held three years. He commanded the Russian army during the invasion of Napoleon and was defeated by the French at Smolensk, and subsequently adopted the Fabian tactics of evading the enemy, which, though unpopular in Russia, was the means of destroying the French army. He was superseded by Kutusov in 1813, but was soon reinstated and commanded in the battles of Bautzen and Leipzig.

Bar-Cocheba (*bȧr-ķōķ'vä*), SIMON, the celebrated Jewish leader in the rebellion against Hadrian, Emperor of Rome, from 131-35 A.D. The events of his life belong to Jewish history. His reputation hinges largely upon the capture of Jerusalem in 132 A.D., which was followed by a general movement among the Semitic people to restore the Jewish kingdom. He was slain in 135, when the Romans reconquered Jerusalem and razed it to the ground. The general dispersion of the Jews dates from this final struggle to retain possession of the holy city.

Bard (*bärd*), a poet who celebrated in verse and song the exploits of heroes and chiefs. Mention was made in Roman writings of the bards of Gaul 200 years before the advent of Christ, but these singers disappeared early among the people of the continent. The bards of the insular Celts continued important as social factors throughout the Middle Ages, probably because they maintained a form of organization. The Welsh bards are especially noted for their writings on a variety of subjects, including secular and religious themes. It is related that the Scottish bards were skilled in singing their productions to the accompaniment of the harp. Gray's "The Bard" is based upon the persecution of the Welsh bards by Edward I of England, who looked upon them as promoters of sedition. In modern times the term is used as a synonym of poet.

Bareilly (*ba̭-rā̆'lĭ*), or BARELI, a district and its capital city, in the Rohilkhand division of Uttar Pradesh state, India. The district has an area of 1,164 sq. m. and a population (1951) of 1,269,233. The city, a commercial center, *ca.* 135 m. E. of Delhi, is on the Ramganga River. Population, 1951, 208,083.

Barge (*bärj*), a marine craft for carrying cargo which has no machinery for self-propulsion. The barge is attached to a towboat or tugboat and used for conveying freight.

Barge Canal, NEW YORK STATE. See *New York State Barge Canal System.*

Barham (*bär'ȧm*), RICHARD HARRIS, clergyman and author, born at Canterbury, England, Dec. 6, 1788; died June 17, 1845. He is known by the pen name of Thomas Ingoldsby. He studied at Oxford and was ordained in 1813, and in 1842 was appointed divine lecturer at St. Paul's. "Ingoldsby Legends," a series of comic tales written by him, became very popular. He also published "Cousin Nicholas" and contributed to magazines and current periodicals.

Bar Harbor, a noted summer resort in Mt.

VIEW OF BAR HARBOR, MAINE

Courtesy Maine Development Commission

Desert Island, off the coast of Maine, 45 m. S.E. of Bangor. The island, with an area of 98 sq. m., has beautiful mountain scenery and is famous as a resort. In 1947 part of the town was destroyed by a forest fire. Population, 1960, 2,444.

Bari (*bä'rē*), a city in Italy, capital of the region of Apulia and the province of Bari, on the Adriatic Sea. It is a busy seaport. The city's commerce centers in almonds, cereals, wine, and olive oil, while its manufactures include textiles, flour and other food products, soap, and chemicals. The seat of an archbishopric and of a university, Bari has a number of ecclesiastical buildings dating from the Middle Ages, notably the 11th-century cathedral and the Church of San Nicola, containing relics of St. Nicholas (*q.v.*). Known to the Romans as Barium, it flourished as early as 200 B.C. It was an independent duchy in the 14th century. Damaged by German bombardment in World War II, Bari was occupied by Allied forces in 1943. Population, 1951, 273,801.

Baring (*bâ'ring*), the name of a family of British bankers, many of whom were prominent in finance and diplomacy. Baring Brothers, later a celebrated banking house, was founded in 1770 by SIR FRANCIS BARING (1740-1810) and his brother, JOHN. Sir Francis was one of the most influential bankers in Europe and was a member of Parliament for many years. At his death, the business passed to his second son, ALEXANDER BARING (1774-1848), Lord Ashburton (*q.v.*). Successive generations of Barings continued to manage the banking house and to take active part in public life. THOMAS GEORGE BARING (1826-1904), earl of Northbrook, was viceroy of India. EVELYN BARING (1841-1917), earl of Cromer, a grandson of Sir Francis, was British agent and consul general in Egypt, 1883-1907, and virtually ruled the country, reforming and reorganizing the administration. His son, EVELYN BARING (1903-), was British High Commissioner in South Africa (1944-51) and governor of Kenya (1952-59). Another well-known member of the family was MAURICE BARING (1874-1945), foreign correspondent and author.

Baring-Gould (*bâ'ring-gōōld*), SABINE, clergyman and author, born in Exeter, England, Jan. 28, 1834; died in Lew Trenchard, Jan. 2, 1924. He was ordained as a priest of the Church of England in 1864. His first appointment was as a curate in Horbury, Yorkshire. Inheriting his father's estate of Lew Trenchard, Devon, in 1872, he was also vicar of the parish after 1881. His writings include religious works, such as "Lives of the Saints" (1872-77), folklore, such as "The Book of Were-Wolves" (1865), novels, such as "Mehalah" (1880), and the hymns "Onward, Christian Soldiers" and "Now the Day Is Over."

Barite (*bâr'īt*) or BARYTES, a barium mineral. See *Heavy Spar*.

Baritone (*băr'ĭ-tōn*), in music, a term for the male voice whose range is intermediate between the tenor and bass. In tone, it is heavier and richer than the tenor and lighter and more flexible than the bass.

Barium (*bâr'ĭ-ŭm*), an element of the alkaline earth group, with an atomic weight of 137.34. Its atomic symbol is Ba and its number 56. Barium resembles calcium and strontium (*qq.v.*). It is a silvery-white, soft metal, very reactive chemically. It is prepared by passing an electric current through a melted barium salt. Barium compounds are used in fireworks to produce a green color in the flame. Barium sulfate ($BaSO_4$) is an insoluble compound; it is used in medicinal diagnosis as a test meal in X-ray examinations. Soluble compounds of barium are very poisonous. See also *Heavy Spar*.

Bar-Jesus (*bär-jē'zŭs*), a Jewish sorcerer and false prophet who interfered with Paul's work. He is also referred to as Elymas (Acts 13:6-12).

Bark (*bärk*), the part of the stem of a woody perennial (either tree or shrub, and either dicotyledon or gymnosperm) that lies outside of the wood. In stems less than one growing season old, the bark is mostly soft and living, partly green, and active in making and transporting food. In older stems, the *inner bark* (phloem or bast) consists partly of hard dead fibers and partly of soft living cells forming tubes through which flow dissolved sugars, from the leaves to the stem and root; the *outer bark* is hard, dry, dead, and inactive because the outer tissues have become separated from their supply of water by the formation of layers of *cork*. Some useful substances obtained from the bark of certain plants are tannin, gums, and fibers.

Bark Beetle (*bē'tʼl*), the common name of the Scolytidae, a family of small beetles. They burrow deep chambers beneath the bark of trees and woody plants in which they lay their eggs, thus causing great damage to forests.

Barker (*bär'kẽr*), EUGENE CAMPBELL, historian, born near Riverside, Texas, Nov. 10, 1874; died in 1956. A graduate of the Univ. of Texas (1899), he studied at the Univ. of Pennsylvania (Ph.D., 1908) and was professor of history at the Univ. of Texas (1908-45). Considered the foremost historian of the settlement of Texas, he wrote "Mexico and Texas, 1821-1835" (1928) and "The Writings of Sam Houston" (8 vols., 1938-43).

Barker, JAMES NELSON, playwright and politician, born in Philadelphia, Pa., June 17, 1784; died in Washington, D.C., March 9, 1958. Barker's dramas are notable for their craftsmanship and for their use of American themes. Among his most popular plays are "The Indian Princess" (1808) and "Superstition" (1824). Barker was elected mayor of Philadelphia in 1819 and later (1838-58) served in various capacities with the U.S. Treasury.

Barkla (*bärk̦'lạ*), CHARLES GLOVER, physicist, born in Widness, Lancashire, England, June 7, 1877; died Oct. 23, 1944. He was a teacher and research physicist at the Univ. of Edinburgh (1913-44). His discovery of the characteristic X-rays of elements opened the field of X-ray spectroscopy. Barkla was awarded the Nobel Prize in Physics (1917) for his work on the diffusion of light. His important contribution to X-ray research includes the discovery of the laws of X-ray scattering and laws governing the transmission of X-rays through matter.

Barkley (*bärk̦'lê*), ALBEN WILLIAM, 35th Vice President of the U.S., born in Graves County, Ky., Nov. 24, 1877; died in Lexington, Va., April 30, 1956. He was graduated from Marvin Coll. and was admitted to the Kentucky state bar in 1901, becoming prosecuting attorney of McCracken County four years later. He was appointed county judge in 1909 and in 1913 went to the House of Representatives. Barkley was first elected to the Senate in 1926 and was majority leader of that body, 1937-47. In 1948, as President Truman's running mate on the Democratic ticket, he was elected to the Vice Presidency of the U.S. During his term he gained the affectionate title of "Veep." Barkley withdrew as candidate for the Presidential nomination in 1952, when his age seemed to bar the support of influential Democratic party factions. He appeared on a TV program, "Meet the Veep," but in 1954 he was again elected to the Senate.

ALBEN W. BARKLEY

Barkokba, SIMON. See *Bar-Cocheba, Simon.*

Barlaam and Josaphat (*bär'lā-ŭm and jō'sȧ-făt*), a Christianized version of an Indian legend believed to be based on the life of Buddha. Originating in India between 100 B.C. and A.D. 100, the legend was carried into the Byzantine Empire *ca.* A.D. 600 and later translated into Greek by a Christian monk. The story entered into late medieval literature in a Latin version by Anastasius, a papal librarian. Thereafter, it enjoyed wide currency as a morality tale and popular romance in many languages.

The story concerns a young Indian prince, Barlaam, whose first encounter with human misery is interpreted according to Christian tradition, by the hermit, Josaphat. Barlaam is thereby converted to Christianity and, with his teacher, retires to the desert to lead a life of asceticism and contemplation.

Barlach (*bär'läk̦h*), ERNST, artist, born near Hamburg, Germany, Jan. 2, 1870; died in Gustrow, Oct. 26, 1938. Barlach began his art education in Hamburg and Dresden and continued in Paris (1895-96), where he became interested in the intense paintings of Van Gogh, but a more decisive influence was his trip to southern Russia in 1910. His sculpture "Man Drawing a Sword" (1911) shows the influence of Russian folk sculpture in its rough-hewn solidity and in the strong movement contained within the block of wood, his favorite medium. Later works, like the "Singing Man" (1928) show a similar modeling in large planes, but a deeper emotional feeling. Barlach worked on a monumental scale in the World War I memorials for Gustrow, Kiel, and Magdeburg and was influential as a graphic artist. He also wrote a number of dramas.

Bar-le-Duc (*bȧr-lê-dük̦'*), a town in northeastern France, the capital of the Meuse department, 128 m. E. of Paris. Noted principally for its processing of wines and preserves, the town is situated in the beautiful Ornain valley, where there are many picturesque dwellings dating from the 16th and 17th centuries. Commerce, including textile and hosiery manufacturing, is confined to the lower part of the town. Population, 1946, 15,460.

Barletta (*bär-lĕt'tȧ*), a city and seaport in southern Italy, in Bari province, in the region of Apulia. Located on the Adriatic Sea, it has a coastwise export trade, consisting mainly of grains, fruits, wines, and olives. The city is rich in Romanesque and Gothic architecture and other art treasures. Nearby is the site of the battle of Cannae, where Hannibal defeated the Romans in 216 B.C. Population, 1947, 62,057.

Barley (*bär'lĭ*), botanically *Hordeum vulgare*, an important small grain and thus a member of the grass family. In growth it resembles wheat and rye but is the shortest of the three, reaching 1 to 3 ft. in height. Like wheat and rye, its flowers and grains are borne in crowded ears or heads. In barley, the flowers are attached in sets of three, side by side, to form two vertical triple rows. Three main types are distinguished, based on the way the grains are developed at maturity. In tworowed barley, only the middle flower of each set forms a grain. In six-rowed barley, all the flowers form grains. In four-rowed barley, while all the flowers form grains, the side grains overlap their neighbors so that there appear to be only four rows.

Over the world, 2,000,000,000 bu. of barley are raised each year, chiefly in cooler regions. In the U.S., 25 per cent of the *ca.* 220,000,000 bu. produced annually is used to make malt in the process of beer-making. Most of the rest is used as animal food.

Barlow (*bär′lô*), FRANCIS CHANNING, soldier and jurist, born in Brooklyn, N.Y., Oct. 19, 1834; died in New York City, Jan. 1, 1896. He was graduated (1855) from Harvard. Barlow served in the Union Army during the Civil War, taking part in the battles of Fair Oaks, Antietam, and Gettysburg. In 1865 he was mustered out with the rank of major general, and, in the same year, he was elected secretary of state for New York. As attorney general (1871-73), he directed the prosecution of the Tweed Ring (see *Tweed, William Marcy*).

Barlow, HOWARD, conductor, born in Plain City, Ohio, May 1, 1892. Educated at Reed Coll., Portland, Ore., and at Columbia Univ., he pursued a musical career and made his debut as an orchestral conductor at the MacDowell Festivals at Peterborough, N.H., in 1919. Barlow was conductor of the American National Orchestra (1923-25) and at the Neighborhood Playhouse in New York City (1923-27). Then, until 1943, he conducted the "Symphonic Hour," the "Philco Radio Hour," and other programs of the Columbia Broadcasting System. He was musical director of the "Voice of Firestone," a program presented by the National Broadcasting Co. (1943-54) and by the American Broadcasting Co. (1954-59). Barlow's own compositions include songs and a tone poem for orchestra, "Within a Temple" (1919).

Barlow, JOEL, poet, born in Redding, Conn., March 24, 1754; died near Kraków, Poland, Dec. 24, 1812. Following his graduation from Yale Univ. in 1778, where his poetic talent was first recognized, he studied law, edited a newspaper, entered business, and taught school. He was identified with the Hartford Wits (*q.v.*), a group of American poets. To this period belongs his ponderous epic, "The Vision of Columbus" (1787, reissued as "The Columbiad," 1807). After 1788, Barlow lived in Europe for many years, associating, among others, with Thomas Paine (*q.v.*) and becoming a passionate republican. His political thought is expressed in "The Conspiracy of Kings" (1792) and "Advice to the Privileged Orders" (1792). He was U.S. consul to Algiers (1795-97) and U.S. minister to France (1811-12). Sent to Europe by President Madison in 1811 to negotiate a commercial treaty with Napoleon I (who was then deeply involved in his Russian expedition), Barlow died before the interview took place. One of his best known poems is the light, mock-heroic "Hasty Pudding" (1796).

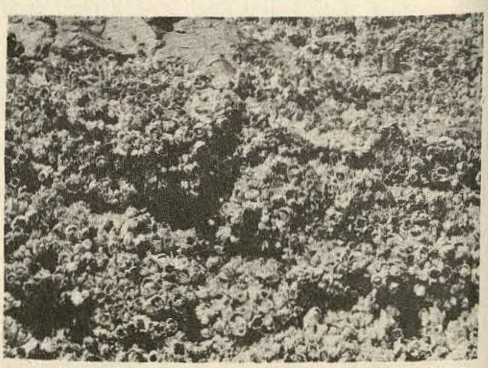
Barmecide's Feast (*bär′mê-sīd*), an "Arabian Nights" tale, in which a member of the Barmecide family set empty dishes before a beggar and invited him to partake of imaginary dainties. The beggar obligingly pretended to eat what was not before him. After drinking a quantity of nonexistent wine, moreover, he feigned drunkenness and cuffed his host's ears. Possessing a sense of humor, the Barmecide enjoyed the beggar's joke and promptly served him with a bounteous meal.

Barmen (*bär′mĕn*). See *Wuppertal.*

Bar Mitzvah (*bär-mits′vä*), a Hebrew term, meaning "son of command"; a Jewish ritual signifying a boy's acceptance of religious responsibilities upon reaching the age of 13. The boy is usually called up to the synagogue altar during a ceremony on the Sabbath nearest his 13th birthday to read a portion of the Torah (*q.v.*). In the U.S. the initiation ritual has become a cardinal feature of Judaism, accompanied by extensive ceremony and social celebration. Corresponding ceremonies for girls, called confirmations, have been introduced in both reformed and conservative congregations.

Barnabas (*bär′nȧ-bạs*), SAINT, apostle, died *ca.* A.D. 61. Barnabas, meaning "Son of Prophecy," was the surname given to Joses, or Joseph, a Cyprian Levite. Barnabas is mentioned in Acts IV:36-37; XI:22, 30; and other chapters. He founded the first Christian community at Antioch, is reputed to have been the bishop of Milan, and is thought to have suffered martyrdom at Cyprus. His feast day is June 11.

Barnacle (*bär′nạ-ḳ′l*), a degenerate marine crustacean related to the crabs, in the subclass Entomostraca of the order *Cirripedia.* Although the adult barnacle, usually less than an inch in diameter, is permanently fixed in position, its



Courtesy Amer. Museum of Natural History, N. Y.

BARNACLES

first and second larvae are free-swimming, with definite crustacean characteristics. The second larva, called cypris, settles down into place, anchoring itself with its antennae. It metamorphoses into the fixed adult, in which form it is almost entirely headless. The adult feeds on small marine animals, which it catches by extending six pairs of two-branched feathery appendages from its shell to grasp the unwary individuals floating within reach.

Many species of barnacles are worldwide in distribution. Best known is the *acorn barnacle;* enormous numbers of these attach directly to rocks, piles, and ship bottoms, forming rough grayish incrustations. The *goose barnacle* attaches itself by means of a leathery stalk; it, too, may be found on ship bottoms. Since barnacles impede the speed of ships, poisonous paints are often employed to discourage their attachment.

Barnard (*bär′nard*), FREDERICK AUGUSTUS PORTER, educator, born in Sheffield, Mass., May 5, 1809; died in New York City, April 27, 1889. A graduate (1828) and faculty member of Yale, he taught at institutions for the deaf and mute until 1837, when he was appointed professor of mathematics and natural philosophy at the Univ. of Alabama. He subsequently held a similar post at the Univ. of Mississippi, where he served as president (1856-58) and chancellor (1858-61). After a period of research in astronomy, he became president of Columbia Coll. (now Columbia Univ.) in 1864. During his long administration there (until 1889) he expanded the curriculum, aided the sciences, and supported higher education for women. The author of textbooks in mathematics, physics, education, and economics, he was one of the founders of the American Assn. for the Advancement of Science and the National Academy of Sciences. Barnard Coll. was named in his honor.

Barnard, HENRY, educator, born in Hartford, Conn., Jan. 24, 1811; died there, July 5, 1900. Educated at Yale, he was admitted to the bar in 1835 and served in the state legislature. Leaving politics in 1839 to become school commissioner of Connecticut, he reorganized that state's public school system. Later (1843) he served Rhode Island in a similar capacity. Chosen chancellor of the Univ. of Wisconsin in 1858, he later was president of St. John's Coll., Annapolis, Md., and was the first U.S. Commissioner of Education (1867-70). As an educator, Barnard ranks with Horace Mann (*q.v.*); both furthered the cause of popular education in the U.S. by raising standards and revising the curriculum. Barnard edited the influential *American Journal of Education* (31 vols. 1855-81), containing translations of many European educational classics, which were subsequently reprinted as a 52-volume "Library of Education."

Barnard College, the undergraduate college for women of Columbia Univ., New York City. Founded in 1889, it offers courses in liberal arts and sciences leading to the degree of Bachelor of Arts. Barnard Coll. is situated near the Hudson River with its campus adjoining that of Columbia Univ. It has a library of *ca.* 70,000 volumes, two academic buildings, and two residence halls. In 1954 student enrollment was *ca.* 1,130, while the faculty numbered 175.

Barnburners (*bärn′bûrn-ẽrs*), a name given to the reform wing of the Democratic party in New York State from 1843 to 1848, in opposition to the conservative group called Hunkers. The name derived from the story of the farmer who burned his barn in order to kill the rats, the allusion being that the reformers, in their zeal to abolish abuses in the public works and the large corporations, would, in the process, destroy the very foundations of those institutions. Uniting with the Free Soilers in 1848, they nominated Martin Van Buren (*q.v.*) for President. As a result, they split the Democratic party, making possible the election of the Whig candidate, Zachary Taylor.

Barnby (*bärn′bў*), SIR JOSEPH, musician, born in York, England, Aug. 12, 1838; died in London, Jan. 28, 1896. Educated at the Royal Acad. of Music, London, he became director of musical instruction at Eton in 1875 and subsequently was made conductor of the London Musical Society. A great popularizer of choral music, he composed many well-loved songs, such as "Sweet and Low," hymns, including "Now the Day Is Over" and "O Perfect Love," and the oratorio, "Rebekah."

Barnegat Bay (*bär′nē-găt bā*), an inlet of the Atlantic Ocean in Ocean County, eastern New Jersey, extending *ca.* 30 m. north to south between barrier reefs and the mainland.

Barnes (*bärnz*), ALBERT, theologian, born in Rome, N.Y., Dec. 1, 1798; died in Philadelphia, Pa., Dec. 24, 1870. He studied at Princeton Sem. and became minister of the First Presbyterian Church in Philadelphia in 1830, retiring in 1867. He was a leader of the liberal wing (the so-called New School) of the Presbyterian Church, which opposed the strict Calvinist interpretation of church doctrine advanced by the conservatives (Old School). Barnes was renowned for his commentaries on the Scriptures, and his "Notes on the New Testament" (11 vols., 1832-1848) was read widely.

Barnes, ALBERT COOMBS, art collector, educator and author, born in Philadelphia, Pa., in 1873; died there, July 24, 1951. He received an M.D. degree from the Univ. of Pennsylvania (1892) and later studied physiological chemistry in Germany. His research and the manufacture of the antiseptic solution Argyrol, as well as other medical preparations, made him a millionaire by the time he was 35. Business success enabled him to devote himself to the collection of art. Soon he was known as the most notable art collector in the U.S. and a connoisseur of modern French painting. In 1921 he established the Barnes Foundation at Merion, Pa., endowing it with $10,000,000 for the free instruction of deserving art students. Among his writings are "The Art of Matisse" (1933), "The Art of Renoir" (1935), and "The Art of Cézanne" (1939).

Barnes, HARRY ELMER, sociologist and author, born in Auburn, N.Y., June 15, 1889. Educated at Syracuse and Columbia Univs., he taught social science at Clark Univ. (1920-23) and Smith Coll. (1923-30) and thereafter served on the editorial staff of the Scripps-Howard newspapers. Primarily a synthesizer, Barnes organized the separate strands of the social sciences into a pattern which lends comprehension to Western man's total social and cultural development. Among his writings, which have given new breadth and perspective to the teaching of history, are "Social History of the Western World" (1921), "Progress of American Penology" (1922), "History of Western Civilization" (1935), and, with Howard Becker, "Social Thought from Lore to Science" (1938).

Barneveldt (*bär′nē-vĕlt*), JAN VAN OLDEN, statesman, born in Amersfoort, Holland, Sept. 14, 1547; died May 13, 1619. He became Grand Pensioner of Holland in 1586 and thus represented Holland in the States-General, the parliament of the United Provinces. Under his leadership, Dutch commerce expanded tremendously and the Dutch East India Co. was founded. In 1609, he negotiated a 12-year treaty with Spain, which ended the long struggle for Dutch independence from that country. Barneveldt's policies dominated Dutch civil affairs until 1618, when he became party to a conflict that ended with his execution.

As a representative of the commercial interests, whose growth had been fostered by the States-General, he favored an increasing control of state affairs by that assembly. In this, he was opposed by the nobles and the House of Orange. The struggle was intensified by religious differences between the Remonstrants (an Arminian sect) and the strict Calvinists. In siding with the Remonstrants, Barneveldt was brought into conflict with Maurice of Nassau, Dutch Captain-General. Maurice, who had long been his personal opponent, threw his support to the Calvinists and William of Orange. The situation was forced to a climax when William convoked the Synod of Dort, which officially condemned the doctrines of the Remonstrants. Barneveldt and his friends were arrested, accused of religious and political malpractices, and sentenced to death by a court packed by their personal enemies. No evidence has ever been found to substantiate the charges or to throw suspicion on Barneveldt's conduct as a public official. Today, he is regarded one of Holland's greatest patriots.

Barney (*bär′nĭ*), JOSHUA, naval officer, born in Baltimore, Md., July 16, 1759; died in Pittsburgh, Pa., Dec. 1, 1818. Entering the naval force early in the American Revolution, he performed many daring feats and became a lieutenant in 1776. As captain of the *Hyder-Ally* in 1782, he captured the British ship, *General Monk,* in Delaware Bay. From 1796 to 1802 he served ably in the French Navy. The War of 1812 found him again in the U.S. Navy. During the British attack on Washington in 1814, he commanded a valiant defense of that city before it fell to the enemy. President Monroe appointed him naval officer of the port of Baltimore in 1817.

Barnstable (*bärn′stȧ-b′l*), the seat of Barnstable County, Massachusetts, on the south shore of Cape Cod, located in Barnstable town, a popular summer resort area, which includes the county seat and the unincorporated communities of Hyannis and Osterville. Fishing and cranberry-raising are the principal occupations. Population, 1950, 10,480.

Barnum (*bär′nŭm*), PHINEAS TAYLOR, showman, born in Bethel, Conn., July 5, 1810; died in Bridgeport, Conn., April 7, 1891. His first venture in show business took place in 1835 when he exhibited Joice Heth, a Negro woman, whom he billed as 160 years old and a nurse of George Washington. In 1842 he opened the American Museum in New York City, known for its curious exhibits and fabulous hoaxes. One of its principal attractions was the dwarf, Charles S. Stratton (see *Dwarf*). In 1850 Barnum brought Jenny Lind (*q.v.*), "the Swedish Nightingale," to the U.S. and managed her American tour.

In 1871 he organized his extravagant circus, "The Greatest Show on Earth," and a decade later joined with his competitor, A. J. Bailey, to form the popular Barnum and Bailey Circus. At the same time, he imported from a London zoo a giant African elephant called Jumbo.

Barnum also served in the Connecticut legislature (1865-69) and was mayor of Bridgeport in 1875. He wrote "The Humbugs of the World" (1865), "Struggles and Triumphs" (1869), and his "Autobiography" (1854), later republished as "Barnum's Own Story" (1927).

Baroda (*bȧ-rō′dȧ*), a city of India, 244 m. N. of Bombay, with which it is connected by railway. It occupies a prominent site on the Viswamitri River, which is crossed by several stone and steel bridges. It is the seat of Baroda Coll. It has cotton mills and a large trade in grain, merchandise, and livestock. The state of Baroda, of which it was the capital, was merged with Bombay Province in 1949. Pop., 1951, 211,407.

Barometer (*bȧ-rŏm'ê-tẽr*), an instrument used in measuring atmospheric pressure. There are two kinds of barometers, mercurial and aneroid.

The *mercurial barometer* is constructed essentially from a glass tube about 33 in. long and closed at one end. The tube is filled with mercury; then while the open end is closed with a finger, the tube is inverted and immersed in an open vessel of mercury. When the finger is removed from the vertically supported tube, a portion of the mercury in the tube passes into the vessel; but a column of mercury remains in the tube, being supported by the pressure of the air on the mercury in the vessel. At sea level the top of the column of mercury is about 30 in. above the mercury level in the vessel; at higher elevations, the column is shorter, being supported by a lower air pressure. The weight of the mercurial column is equal, in all cases, to the weight of a column of air of equal cross-sectional area extending from the level of the vessel to the top of the atmosphere.

The first mercurial barometer, known as the *Torricelli tube,* was constructed in 1643 by Evangelista Torricelli (*q.v.*), an Italian, who used the instrument to demonstrate that air possesses weight, as evidenced by its ability to support a column of mercury.

The *aneroid* barometer, as implied by its name, is made without a liquid. Essentially it is a flat, airtight, metal box from which the air has been partially exhausted. As the atmospheric pressure changes, the box is slightly compressed or expanded; this change moves an attached pointer across a dial graduated in pressure units. This instrument was first built in 1843 by Lucien Vidie.

Because of its small size, light weight, and sturdy construction, the aneroid is portable, an important advantage over the more fragile, bulky mercurial barometer. But the aneroid has inherent errors owing to imperfect response of the metal capsule and its mechanical linkages to the pointer; thus, it must be checked frequently against the highly accurate mercurial barometer.

As mentioned above, atmospheric pressure decreases with altitude because the higher the elevation, the less air remains overhead. At sea level the mercury column of a barometer is about 30 in. high, at 18,000 ft. only about half as high. At altitudes reached by rockets of the V-2 type, pressure is so small that specially designed instruments must be used to measure or compute it (see also *Rocket*).

The precise decrease of pressure with altitude depends on the temperature (and to some extent the moisture) distribution in the air column. With a suitable assumption concerning the temperature distribution, a barometer may be used to measure altitude. An aneroid barometer with a scale calibrated to indicate elevation rather than pressure is one type of altimeter used in airplanes. If the current distribution of temperature with altitude is different from the assumed one, the elevations indicated by the instrument are only approximate.

Much study has been given to weather forecasting based on atmospheric changes as indicated by the barometer. In describing the purpose of the experiment which resulted in the invention of the mercurial barometer, Torricelli made a statement anticipating such a use of the barometer; he stated that he aimed "not simply to produce a vacuum, but to make an instrument which shows the mutations of the air, now heavier and dense, and now light and thin." In 1656 Florin Perrier discovered that the height of the mercury column often varied with the weather. In years that followed, mariners and others concerned with changes in weather were guided by barometer registrations. They learned, for example, that a rapidly falling barometer often indicates stormy weather; a rising barometer, good weather. These and other forecasting rules based on barometer indications are not infallible, and forecasters take into account many additional factors. See *Meteorology.*

Baronet (*băr'ŭn-ĕt*), a hereditary English title, without privilege of peerage, instituted in 1611 by James I. Baronets have *Sir* placed before their names, and *Baronet,* generally abbreviated *Bart.,* after, *i.e., Sir John Jones, Bart.*

Baroque (*bȧ-rōk'*), a term used in the history of the figurative and liberal arts, characterizing creations of the period extending from the second half of the 16th century through the first half of the 18th century. The term is derived from the Italian *barocco,* meaning an irregular, misshaped pearl.

Typical masters of the baroque style were Giovanni Lorenzo Bernini (1598-1680) in sculpture, Peter Paul Rubens (1577-1640) in painting, and Johann Sebastian Bach (1685-1750) in music.

See also *Architecture; Art.*

Barquisimeto (*bär-kē-sê-mä'tō*), a city in Venezuela, capital of the state of Lara, on the Barquisimeto River. It is surrounded by a fertile plain and has a good trade in cereals and livestock. A cathedral, the government palace, and a college are among the public buildings. The first settlement made in its vicinity by the Spaniards dates from 1552. In 1812 the city was destroyed by an earthquake, but was soon rebuilt, and in 1830 became the capital of a state of the same name. Population of the city, 1950, 105,080.

Barr (*bär*), AMELIA EDITH, novelist, born in Ulverston, England, March 29, 1831; died in New York City, March 10, 1919. She was educated at Glasgow. In 1854 she moved with her husband, Robert Barr, to Texas, and in 1869 went to New

York City to engage in literary work. Her numerous novels, based largely on scenes in England and Scotland, include "Romance and Reality," "Remember the Alamo," and "Jan Vedder's Wife."

Barr, ROBERT, novelist, born in Glasgow, Scotland, Sept. 16, 1850; died in Woldingham, Surrey, England, Oct. 22, 1912. He went to Canada at an early age and attended the Normal School at Toronto. He was headmaster of a school in Windsor for a number of years. In 1876 he joined the editorial staff of the Detroit *Free Press,* to which he contributed under the name *Luke Sharp.* He moved to London in 1881 and with Jerome K. Jerome founded the *Idler* Magazine. He wrote books—"A Woman Intervened" (1896), "The Countess Tekla" (1899), etc., and "The Triumphs of Eugène Valmont" (1906), detective stories.

Barr, STRINGFELLOW, educator, born in Suffolk, Va., Jan. 15, 1897. After receiving his B.A. and M.A. degrees at the Univ. of Virginia, he went to Oxford as a Rhodes scholar; Barr later studied at the Univ. of Paris and the Univ. of Ghent (Belgium). He began his academic career as assistant professor of modern European history at the Univ. of Virginia, 1924, serving as full professor, 1930-37. He served as president, member of the board of visitors, and a governor of St. John's Coll., Annapolis, Md., 1937-46. During his tenure at St. John's, the institution's plan of study attracted national notice. He was president of the Foundation for World Government, 1948-58, and became professor of humanities at Rutgers Univ. in 1955. Barr was editor of the *Virginia Quarterly Review* in 1930-34; his own books include "The Pilgrimage of Western Man" (1949) and a novel, "Purely Academic" (1958).

Barracuda (*băr-ȧ-k̤o͞o'dȧ*), a large, rapacious fish belonging to several species found in tropical and subtropical seas and on both American coasts. It sometimes swims in close to shore and may attack bathers. The California species is 4 to 5 ft. long, the Atlantic type smaller.

Barranquilla (*bär-rȧn-k̤ēl'yȧ*), chief seaport of Colombia, on the Magdalena River, 11 m. from the Caribbean Sea. It is connected with Sabinilla, its port on the Caribbean, by a railroad. Formerly only smaller boats could navigate the Magdalena at this point, but it has been improved by dredging and now admits larger vessels. The city has a large trade in produce. Population, 1951, 285,000.

Barras (*bȧ-rȧ'*), PAUL FRANÇOIS JEAN NICOLAS, COMTE DE, revolutionist, born at Fox-Amphoux, France, June 30, 1755; died at Chaillot, near Paris, Jan. 29, 1829. In early youth he became a soldier in India in opposition to the British. After attaining the rank of captain, he returned to France and joined in the French Revolution, with the hope of regaining his dissipated fortune. He rapidly rose to eminence and became (1792) a member of the National Convention, in which he opposed the royalists and voted for the execution of the king. At Toulon he conducted a siege against the royal insurgents. His resourceful leadership in the southern part of France caused the revolutionaries to triumph in that part of the country. In 1794 he aided in the overthrow of Robespierre, and the next year became commander in chief of the army, but later yielded to the rising popularity of Napoleon Bonaparte. He wrote personal memoirs of importance, which were seized by the government on the charge that they were treasonable, but they were subsequently published. Much of his later life was devoted to plotting against the government, his political career having been ended by Napoleon in 1799.

Barre (*băr'rê*), a city in Washington County, Vermont, 7 m. S.E. of Montpelier, on the Central Vermont and the Montpelier & Barre R.R.'s. Barre is noted for its granite and for the monuments and building materials which are produced in the city and in the surrounding area. The granite sheds are of interest to visitors. The first settlement was made in the vicinity in 1788; Barre was incorporated in 1894. Population, 1950, 10,922; in 1960, 10,387.

Barrel (*băr'ẹl*), a vessel formed of *staves* and surrounded by *hoops*. The staves are fitted carefully and held together tightly by the hoops; at the two ends of the barrel are circular boards called the *heads,* which are fitted in grooves. Most barrels bulge in the middle, the staves in this case being wider in the middle than at the ends, but some staves are larger at the lower end. A *bunghole* is provided to permit the inflow and outflow of liquids.

Many articles of commerce are sold in barrels, but the market value is based upon the quantity in pounds. Thus, a barrel of flour contains 196 and a barrel of pork 200 pounds. The barrel, in wine measure, contains 31½ gallons, and the imperial barrel of England contains 36½ gallons of beer. A barrel of butter consists of 224 pounds.

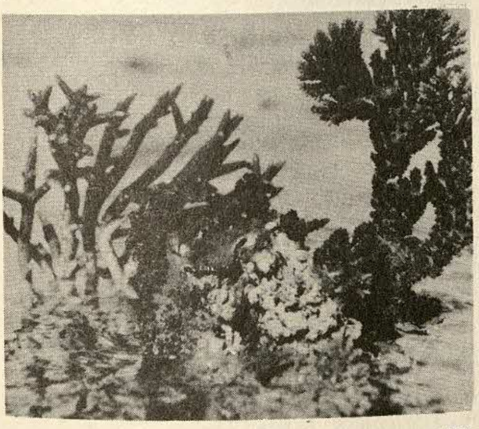
Barrès (*bȧ-rĕs'*), AUGUSTE MAURICE, writer and politician, born in Charmes, France, Sept. 22, 1862; died in Neuilly, Dec. 4, 1923. First the portrayer of modern décadence, as in the collection of novels *"Culte du moi"* (Cult of Myself, 1888-91), he turned later to the cause of chauvinistic nationalism in his novels *"Le Roman de l'energie nationale"* (The Story of National Energy, 1897-1902), *"Les Bastions de l'Est"* (The Ramparts of the East, 1905) and others. Elected deputy from Nancy in 1889, he remained politically active until his death, sided with the anti-Dreyfus party during the Dreyfus affair, and was strongly anti-German.

Barrett (*băr'rĕt*), LAWRENCE, actor, born in Paterson, N.J., April 4, 1838; died in New York City, March 20, 1891. Noted as an actor and manager, he was popular both in the U.S. and

Europe. A close associate of Edwin Booth (*q.v.*), Barrett toured extensively with him and played many Shakespearean roles with his company.

Barrie (*băr′rĭ*), SIR JAMES MATTHEW, playwright and novelist, born in Kirriemuir, Scotland, May 9, 1860; died in London, June 19, 1937. Graduated from Edinburgh Univ. in 1882, he went into journalism. Soon, the reception given his literary sketches of Scottish life, written with the gentle humor and quiet pathos that were to become the hallmark of his style, encouraged him to devote himself to literature. Among his novels are "The Little Minister" (1891) and "Sentimental Tommy" (1896), memorable for their use of Scottish dialect, whimsy, and veiled sentimentalism. The same qualities characterize his dramatic works, such as "Quality Street" (1901), "The Admirable Crichton" (1902), "Peter Pan" (1904), "What Every Woman Knows" (1908), and "Dear Brutus" (1917).

Barrier Reef (*băr′rĭ-ẽr rēf*), the largest coral reef in the world, extending for *ca.* 1,250 m. in the Coral Sea, off the northeast coast of Australia, from Sandy Cape to Torres Strait. It forms a natural breakwater for Queensland, Australia, from which it is separated by a channel 10 to 100 m. wide. Within the reef's waters are coral gardens and unique forms of marine life.



Courtesy Australian News & Information Bureau, N.Y.

CORAL ON GREAT BARRIER REEF

Barron (*băr′rŭn*), JAMES, naval officer, born in Virginia in 1769; died in Norfolk, Va., April 21, 1851. During the Revolution, he served in the Virginia navy under the command of his father, and in 1798 he became first lieutenant in the U.S. Navy. As commodore of the *Chesapeake,* he had just set sail from Norfolk for the Mediterranean on June 22, 1807, when his ship was halted, searched, and bombarded by the British. The incident heightened American resentment against the British, which finally culminated in the War of 1812 (*q.v.*). Barron was court-martialed, found guilty of failure to anticipate the possibility of attack, and suspended for five years. Although he was reinstated, Barron was barred from active duty. Believing that Commodore Stephen Decatur (*q.v.*) was responsible for this, he challenged him to a duel (March 22, 1820), in which Decatur was mortally wounded. This affair deprived Barron of what little public sympathy had been his; and he remained on "waiting orders" for the rest of his navy career.

Barrow (*băr′rō*), in archaeology, a mound of earth constructed for burial and monumental purposes, which may date as far back as the Neolithic period. Many barrows found in Great Britain are alleged to belong to the period of the Roman invasion. Eurasia, northern Africa, and the Mississippi valley of North America are especially rich with these evidences of former populations. Many are long, others are in the form of a bell or cone, and some are broad barrows. Homer's "Illiad" mentions similar artificial mounds in connection with the obsequies of Achilles and Hector. See *Mound Builders.*

Barrow, a village in Alaska, located near Point Barrow, the northernmost point of Alaska, projecting into the Arctic Ocean. The point was discovered in 1826 by the F. W. Beechey expedition. The village is a trading, hunting, and trapping center in an oil-bearing region. Government radio, weather, and naval stations and an airfield are in the vicinity. A monument to Wiley Post and Will Rogers, who were killed here in an air crash (1935), is located 12 m. to the southwest. Population, 1950, 951.

Barrow, a river of Ireland, in Leinster province, rising in western County Laoighis in the Slieve Bloom Mts. It flows east to the County Kildare line, then south along the County Laoighis-County Kildare border and forms the County Kilkenny-County Wexford boundary to Waterford Harbour—a course of *ca.* 119 m.

Barry (*băr′rĭ*), SIR CHARLES, architect, born in Westminister, London, England, May 23, 1795; died in Clapham, London, May 12, 1860. A leader of the revival of Gothic design in English architecture, he is best known as the architect of the Houses of Parliament in London (1840-60), one of the outstanding structures of the period.

Barry, JOHN, naval officer, born in Tacumshane, Ireland, in 1745; died in Philadelphia, Pa., Sept. 13, 1803. He came to America at the age of 15 and settled in Philadelphia, where he became an affluent trader and shipmaster. Volunteering his services at the beginning of the Revolution, he was appointed commander of the *Lexington,* which captured the *Edward,* the first British ship to be taken by an officer of the U.S. Navy. As the gallant commander of the *Raleigh,* he fought heroically against superior British forces; and, as chief officer of the *Alliance* in 1781, he captured two other British vessels. An outstanding naval hero of the American Revolution, he is second only to John Paul Jones (*q.v.*).

Barrymore (*băr′ĭ-môr*), ETHEL, actress, born in Philadelphia, Pa., Aug. 15, 1879; died in Beverly Hills, Calif., June 18, 1959. She was the daughter of Maurice Barrymore (*q.v.*) and the sister of John and Lionel Barrymore (*qq.v.*). Together with her brothers, she carried the Barrymore-Drew tradition of stage pre-eminence to a peak of excellence.

Educated at the convent of Notre Dame in Philadelphia, she first appeared with her grandmother, Louisa Drew, in "The Rivals." Her uncle, John Drew, next gave her a part in "The Bauble Shop." Her first important roles were in "Captain Jinks of the Horse Marines" (1901) and "Cynthia," played in London (1904). Her stage success was established by appearances in "A Doll's House" (1905), "Alice-Sit-by-the-Fire" (1906), "The Silver Box" (1907), "Mid-Channel" (1910), and "The Witness for the Defense" (1911). Miss Barrymore's later appearances include "Romeo and Juliet" (1922), "The Second Mrs. Tanqueray" (1924), "Hamlet" and "The Merchant of Venice," "The Constant Wife" (1926-27), "Scarlet Sister Mary" (1930), and "The Corn Is Green" (1940-43). In "The Love Duel" (1929), two of her children played with her. "Rasputin and the Empress" (1933) brought her to the motion picture screen in company with her brothers. She also was seen on television. She was married (1909-23) to Russell Griswold Colt; they had three children, Ethel Barrymore Colt, John Drew Colt, and Samuel Pomeroy Colt.

Barrymore, JOHN, actor, born in Philadelphia, Pa., Feb. 15, 1882; died in Hollywood, Calif., May 30, 1942. After a Chicago debut in "Magda" (1903) he appeared on the New York stage the same year in "Glad of It." A London tour followed (1905), in "The Dictator," and a trip to Australia with William Collier's troupe. An appearance with his brother Lionel in "The Jest" (1919) won him acclaim. Appearances in "Richard III" (1920) and "Hamlet" (1922) brought him unstinted praise and secured his long-lasting reputation as a Shakespearean actor. He enjoyed many years of stage success in such plays as "A Stubborn Cinderella" (1908), "The Fortune Hunter" (1909), and "Peter Ibbetson" (1917).

In addition, he became a motion picture player. Among his triumphs in this field were "The Dictator," "The Test of Honor," "Beau Brummel," "Don Juan," and "When a Man Loves." His distinguished appearance earned him the nickname "The Great Profile."

Courtesy Brown Bros., N. Y.

JOHN, ETHEL, AND LIONEL BARRYMORE
(from left to right)

Barrymore, LIONEL, actor, born in Philadelphia, Pa., April 28, 1878; died in Hollywood Calif., Nov. 15, 1954. He learned much from his grandmother, Louisa Drew, who introduced him to the stage in "The Rivals" (1893). After appearing with her in "The Road to Ruin," he played in "Squire Kate" (1896), "Cumberland 61" (1897), and several productions with Nance O'Neil's company, followed by two seasons with his noted uncle, John Drew. Among the outstanding performances of his career were "Pantaloons" (1917), "Peter Ibbetson" (1917), and "The Copperhead" (1918). He scored a great success in "The Jest" (1919) and played the leading roles in "Macbeth" (1921), "The Claw" (1922), and "Laugh, Clown, Laugh" (1923).

Also noted are his film roles, principally in "Rasputin and the Empress" (1933) with his brother, John, and sister, Ethel, "On Borrowed Time" (1939), and the "Dr. Kildare" series. His annual broadcast of Charles Dickens's "A Christmas Carol" is a radio classic.

Barrymore, MAURICE (real name HERBERT BLYTHE), actor, born in Agra, India, of English parents, in 1847; died in Amityville, N.Y., March 26, 1905. He went to England to study, but became interested in boxing; he later began a successful career as an actor, selecting the name Barrymore for his profession. In 1875 he made a tour to the chief cities of Canada and the U.S. He played successfully with Mrs. Bernard Beere, Mrs. Langtry, Mme. Modjeska, and Olga Nethersole. His play "Nadjeska" was presented many times by Mme. Modjeska and became very popular.

He was married to Georgiana Drew (1856-93), also a member of a theatrical family, and was the father of Ethel, John, and Lionel Barrymore (*qq.v.*) who carried on the traditions of this famous dynasty of the American stage.

Barter (*bär′tẽr*), a term used in economics to express the exchange of one commodity for another, as contrasted with the sale of commodities for money. In primitive times barter was extensive, each individual exchanging the surplus of his own products for such surplus products of others as he himself might desire. Instead of paying money for clothing or food, the primitive man traded a pig for a sheep, or several commodities for one of greater value than either. This system was conducted in the primitive states of all communities, and can still be found among certain tribes.

Germany under the Hitler regime reintroduced into modern economics a system of barter. Crediting the countries supplying goods with the value of goods delivered, Germany paid in "kind," rather than in cash. Lend-lease (*q.v.*) was a kind of barter necessitated by war emergency.

Barth (*bärt*), HEINRICH, African explorer, born in Hamburg, Germany, Feb. 16, 1821; died in Berlin, Nov. 25, 1865. In 1844 he received the Ph.D. degree from the Univ. of Berlin. His explorations included all the countries bordering on the Mediterranean Sea, the Sahara, and the entire course of the Niger. His writings, valuable geographical and historical accounts, include "Travels and Discoveries in North and Central Africa."

Barth, KARL, theologian, born in Basel, Switzerland, May 10, 1886. He studied at Swiss and German universities and was ordained in the Swiss Evangelical Reformed Church in 1909. He held several pastorates and taught theology at German universities but was expelled from Germany in 1935 under the Hitler regime. In 1919 he published *"Der Römerbrief"* ("Epistle to the Romans"). He became the founder of dialectic theology and advanced the concept in a multivolume work, *"Kirchliche Dogmatic"* ("Church Dogmatics"), that man and God are too different for man to know God. He visited the U.S. in 1962 to give a series of lectures at Chicago Univ.

Barthé (*bär-tā*), RICHMOND, sculptor, born in Bay St. Louis, Miss., Jan. 28, 1901. After studying painting at the Chicago Art. Inst. (1924-28), he turned to sculpture in 1928. A Negro artist of promise, he received several fellowships. His best known works are his bust of Booker T. Washington for the Hall of Fame of New York Univ. and "The Blackberry Woman" at the Whitney Museum of American Art in New York City.

Bartholdi (*bȧr-tôl-dē′*), FRÉDÉRIC AUGUSTE, sculptor, born in Colmar, France, April 2, 1834; died in Paris, Oct. 4, 1904. Turning from painting to sculpture, Bartholdi specialized in public monuments, among them the vigorous "The Lion of Belfort," which he created to commemorate an incident in the Franco-Prussian war. His best-known work, although not considered his most successful, is the colossal statue "Liberty Enlightening the World" on Bedloe's Island in New York, presented to the U.S. by France in 1885. See *Statue of Liberty.*

Bartholomew (*bär-thŏl′ō-mū*), SAINT, one of the 12 apostles, identified with Nathanael, a native of Galilee. Little is known of him and his work. He is mentioned in Mark 3:18, Matthew 10:3, Luke 6:14, and Acts 1:13.

Bartholomew, MASSACRE OF SAINT, the name given to the mass slaughter of French Protestants (Huguenots), beginning on the night of St. Bartholomew's Day (Aug. 24) of 1572 and lasting until the middle of September. The responsibility for the events has never been fully clarified, but the background was political rather than religious. Catherine de Medici (*q.v.*), mother of the vacillating King Charles IX (*q.v.*), opposed the strong influence of Adm. Gaspard de Coligny (*q.v.*), the leader of the Huguenots, on the king, fearing that

ST. BARTHOLOMEW
Engraving by Albrecht Dürer, 1523

he would draw France into war with Spain. Conspiring with the Catholic faction, led by the Guises, she instigated a murder plot against Coligny on Aug. 22. When this failed, the queen mother, anticipating the vengeance of the enraged Protestants, persuaded the king to strike first and to assassinate Coligny and his closest friends. Because the king issued contradictory and confusing orders, the action went out of control, and the Paris mob stormed the houses of the rich Huguenots. In Paris over 2,000 persons died, but when the massacre, by order of the king, was spread throughout France, 25,000 to 50,000 lost their lives. Although there is no evidence that the Vatican had direct influence on the events, Pope Gregory XIII ordered the issuance of a medal commemorating the action.

Bartholomew Fair, the name of a fair formerly held at West Smithfield, London, from 1133 to 1855, for a period of two weeks following St. Bartholomew's Day on Aug. 24. Established by a royal charter of Henry I, it was England's great cloth market. As it gradually gained popularity as a center of amusement, it lost its character as a market and came to an end in 1855.

Bartlesville (*bär′t′lz-vĭl*), county seat of Washington County, Oklahoma, served by the Santa Fe and other railways. It is surrounded by an agricultural, stock-raising, and oil and gas district. Principal industries are zinc smelting and cement manufacturing. It was incorporated in 1897. Population, 1950, 19,228.

Bartlett (*bärt′lĕt*), JOHN, publisher and editor, born in Plymouth, Mass., June 14, 1820; died in Cambridge, Mass., Dec. 3, 1905. While working in the University Book Store in Cambridge, he compiled his famous "Familiar Quotations" (1855). After 1863 he was associated with the publishing firm of Little, Brown & Co.

Bartok (*bär′tŏk*), BÉLA, composer and pianist, born in Nagyszentmiklós, Hungary (now Yugoslavia), March 25, 1881; died in New York, Sept. 26, 1945. A prolific composer, he was known first as a concert pianist and was professor of piano at the Royal Hungarian Musical Acad. in Budapest. He won his first recognition as a composer with his ballet "The Wooden Prince" (1917) and the opera "Duke Bluebeard's Castle" (1911). With Zoltan Kodály (*q.v.*), he studied Slavic and Magyar folk music, and, at his death, had collected over 6,000 folk tunes; his "Hungarian Folk Music" is the classic work in the field. Moving to the U.S. in 1940, he performed as a concert pianist and composed. Hungary's foremost modern composer, Bartók wrote concertos for piano and violin, five string quartets, a "Concerto for Orchestra" (1944) and other works.

Bartolini (*bär-tō-lē′nē*), LORENZO, sculptor, born in Vernio, Tuscany, Italy, Jan. 7, 1777; died in Florence, Jan. 20, 1850. After studying in Paris, where he executed a colossal bust of Napoleon for the Vendôme Column, Bartolini settled in the Italian marble center of Carrara in 1808. He later served as professor of the Academy in Florence and was known chiefly as a sculptor of portrait busts and antique subjects in the neoclassical vein of Canova.

Bartolommeo (*bär-tô-lô-mā′ô*), FRA, also called BACCIO DELLA PORTA, painter, born in Florence, Italy, on March 28, 1472; died in Pian'di Mugnone, Oct. 31, 1517. He opened a workshop in Florence with Mariotto Albertinelli (1474-1511), with whom he had studied under Cosimo Rosselli (1439-1507). Under the impact of Savonarola's sermons, Bartolommeo burnt (1496-97) all of his paintings of nonreligious content. In 1500 he decided to become a Dominican monk and joined, for several years, the monastery of San Marco in Florence. In 1508, however, he visited Venice and later again maintained (1509-12) a workshop with Albertinelli. While on a visit to Rome (1514), he was strongly influenced by Raphael and Michelangelo.

Fra Bartolommeo's art shows the well-balanced composition and brilliant colors of the Renaissance. Among his works, all characterized by great religious feeling, the best known are the mural "The Last Judgment" and several versions of the "Madonna with Saints."

Bartolozzi (*bär-tô-lôt′sē*), FRANCESCO, engraver and painter, born in Florence, Italy, Sept. 21, 1727; died in Lisbon, Portugal, March 7, 1815. He studied under Joseph Wagner at Venice and in 1764 moved to London, where he was elected (1769) a member of the Royal Academy as painter and designer. Despite his success in England, however, he accepted a call to Lisbon as director of the Academy of Arts, to teach and work as an engraver. His masterful engravings—of paintings of other artists and of his own illustrations for such works as Ariosto's "Orlando Furioso" and Milton's "Paradise Lost"—were done mostly in stipple work (a type of engraving using dots rather than lines).

Barton (*bär′tŭn*), CLARA, philanthropist and founder of the American Red Cross, born in Oxford, Mass., Dec. 25, 1821; died in Glen Echo, Md., April 12, 1912. Prior to the outbreak of the Civil War, she taught school and was a clerk in the U.S. Patent Office. During the great conflict, she nursed the wounded in hospitals and on the battlefields and helped to identify thousands of dead and missing soldiers. Subsequently aligning herself with the International Red Cross at Geneva, Switzerland, Miss Barton served heroically at the front during the Franco-Prussian War. Thereafter, as American representative to the international organization, she worked for U.S. participation in the Geneva Convention, devoted to the care of the wounded and prisoners of war.

Courtesy Amer. Red Cross

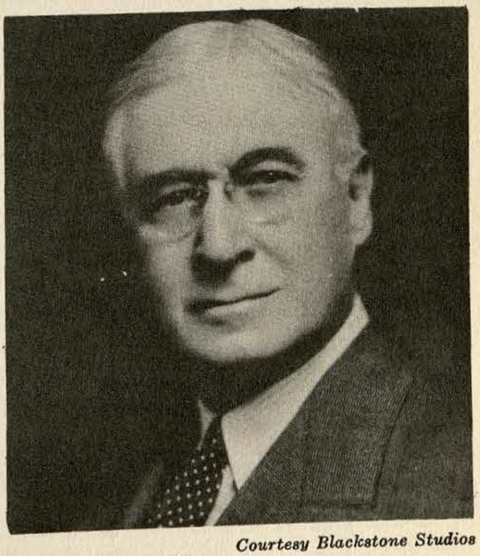
CLARA BARTON

Finally, in 1881, she organized the American Red Cross, serving as its first president until 1904. As U.S. delegate to the International Red Cross in 1885, Miss Barton secured the adoption of a significant amendment which extended Red Cross relief to peacetime catastrophes, such as floods, famines, earthquakes, etc. Among her writings is "An Official History of the Red Cross" (1882).

Barton, SIR EDMUND, statesman, born in Sydney, Australia, Jan. 18, 1849; died in Medlow Bath, Jan. 7, 1920. He was graduated from the Univ. of Sydney (1868) and soon began a successful political career. In 1883 he became speaker of the legislative assembly of New South Wales, serving until 1887. He was a member of the federal conventions in Sydney and Adelaide and a leader in the movement for federation in Australia. In 1901 he became first prime minister of the new Commonwealth of Australia. Appointed first judge of the Australian high court in 1903, he held the post until his death. He was knighted in 1902.

Bartram (*bär'trạm*), JOHN, botanist, born near Darby, Pa., March 23, 1699; died in Kingsessing, Pa., Sept. 22, 1777. Bartram was a noted American Quaker. A farmer, he had become interested in botany as a boy. His correspondence with Linnaeus (*q.v.*) and other European naturalists was instrumental in introducing American plants into Europe. He laid out a botanical garden on his farm near Kingsessing, on the Schuylkill River, the first of its kind in America and now part of the Philadelphia park system. His son WILLIAM (1739-1823) was an eminent naturalist, whose sketches and writings became widely known in the U.S. and Europe. His descriptions of North America, in his "Travels" (1791), influenced many European writers.

Baruch (*bä'rŭk*), a Hebrew scribe of the 6th century B.C. He is mentioned as a friend and companion of Jeremiah, the prophet, and accompanied him to Egypt (Jeremiah 36:4; 32:12). The Book of Baruch, a part of the Apocrypha, is admitted as a part of the canon of the Holy Scriptures by the Roman Catholics.



Courtesy Blackstone Studios

BERNARD M. BARUCH

Baruch (*bạ-rōōk'*), BERNARD MANNES, financier and government adviser, born in Camden, S.C., Aug. 19, 1870. The son of Simon Baruch, an American physician, he was graduated from the Coll. of the City of New York in 1889. He became interested in finance while still young and soon became wealthy through speculation on the New York Stock Exchange. In 1916 President Wilson appointed him a member of the Council of National Defense and of the War Industries Board, of which he became chairman (1918), and later a member of the Supreme Economic Council. He also helped draft the economic recommendations of the U.S. Peace Commission (1919). Assuming the role of an "elder statesman," Baruch again played an influential part during World War II. He advised the government on wartime industrial mobilization and in 1944 made his report to the President on war and postwar plans, in which he stressed the necessity of maintaining free enterprise with a well-planned system of social security and justice. When he was U.S. representative (1946-47) on the U.N. Atomic Energy Commission, he proposed a plan for the international control of atomic energy (*q.v.*) through a world authority, but it was not accepted. He is the author of "American Industry in the War" (1941), "A Philosophy for Our Time" (1954), and his autobiography, "Baruch: My Own Story" (1957).

Barye (*bȧ-rē′*), ANTOINE LOUIS, sculptor, born in Paris, France, Sept. 24, 1795; died there, June 25, 1875. After serving in the army, 1812-14, he completed his studies under several prominent sculptors and became famous for his figures of wild animals.

Baryta (*bȧ-rī′tȧ*). See *Barium.*

Basal Metabolism (*bās′ạl mē-tăb′ō-lĭz′m*), called also BASAL METABOLIC RATE (B.M.R.), in medicine, the measurement of the minimal heat production or energy of an individual at the lowest level of activity, that is, when completely at rest but not asleep. The basal metabolic rate represents the energy necessary to maintain the vital functions of the body, such as respiration, circulation, intestinal action, body temperature, glandular function, and excretion of waste products. The estimation of the B.M.R. is made by means of a device called a calorimeter (*q.v.*), in which the amount of oxygen consumed and of carbon dioxide produced by the subject is measured. The result is expressed as the number of calories of heat produced per hour per-square meter of body surface. The average normal rate is 37 to 40 calories per hour. In clinical usage the deviations from normal are expressed as a plus or minus percentage, such as minus 20% for a low B.M.R., or plus 30% for a high one. Plus or minus 10% is considered within normal limits for the average person. The B.M.R. is used in medical practice as an aid in determining the amount of and results of treatment in such conditions as hypothyroidism (myxedema), hyperthyroidism (Graves' disease), other endocrine disturbances, obesity, sterility, and habitual abortions. See also *Metabolism; Thyroid.*

Basalt (*bȧ-sạlt′*), a dark grey or black rock, composed, in the main, of the minerals augite (a calcium-magnesium-silicon compound), one of the so-called "plagioclase feldspar" minerals (sodium-calcium-aluminum-silicon · compound), and olivine (an iron-magnesium-silicon compound). Basalt comes out of the earth in a molten form through volcanoes and great cracks in the earth's surface. Floods of this incandescent liquid have built up some of the world's most important plateaus, such as the Deccan Plateau of India and the Columbia River Plateau in Washington. When basalt is comparatively fresh, it is dark grey or black; however, exposure to the chemical action of air, rain, or decaying vegetation will turn its surface reddish or greenish. It is thought that basalt may be the ultimate chemical source of most other minerals and rocks. The sediments on the bottoms of the oceans are known to lie on a solid foundation of basalt. Since the granite-rich continents seem to have been worked up out of the ocean bottoms by pressure and adjustment to pressure, it is suspected that the chemical reactions that grew out of these pressures and the heat they produced may have changed basalt into the other major kinds of crystallized rock.

Basalt Ware. See *Chinaware.*

Base (*bās*), in architecture, a term used to describe the bottom, support, or foundation of a structure, or a part of a structure, such as the base of a column.

In chemistry, the term base is used to denote a substance which has the power to unite with an acid and with it form a salt. Water is formed in the process and the metal takes the place of the hydrogen of the acid. A base may be either an oxide or a hydroxide, lime or calcium oxide being an example of the former and potassium hydroxide of the latter. The salt potassium nitrate, or saltpeter, is formed when potassium hydroxide acts upon nitric acid, while the salt sodium sulphate results from the uniting of sodium hydroxide and sulphuric acid. Bases may be either oxygen compounds, as those mentioned above, or they may contain sulfur, iodine, chlorine, bromine, and fluorine. The alkaloids, or organic bases, found in many plants, contain nitrogen. They are considered as substitution compounds of ammonia.

In mathematics, a base is a number from which a set of numbers is determined. The term is used in mathematics in connection with number systems and also with logarithms. In our familiar number system the base is the number 10. Number systems with other bases such as 5, 20, and 60 have been used in the past. A number in any number system can be written as the sum of products of the digits of the system by powers of the base. Thus in our familiar system the number 3725 means $3000+700+20+5$ and this number may be written as $3\times10^3 + 7\times10^2 + 2\times10 + 5$. As an example of a number system with a base other than 10, suppose we had two fingers on each hand and counted on our fingers. We would then count one, two, three, a pair of hands, a pair of hands and one, a pair of hands and two, a pair of hands and three, two pair of hands, two pair of hands and one, and so forth. If the customary symbols are used for one, two, and three, and if we write one pair of hands as 10 (just as we do in our common notation based on five fingers on each hand), then the above counting becomes 1, 2, 3, 10, 11, 12, 13, 20, 21, etc. In this system the base is four and it is denoted by 10 just as the base 10 is denoted by this symbol in the customary number system. We are so familiar with our number system using base 10 that counting in a number system with another base seems somewhat strange.

However, there are groups of people who feel that another base, especially the base 12, has more advantages than the base 10.

The discovery of logarithms by John Napier (1550-1617) increased the speed with which arithmetic computations could be carried out. Napier and Henry Briggs (1556-1630) found that a system of logarithms having the base 10, as in our number system, was especially convenient for arithmetic computation. In certain natural phenomena of growth and decay, the rate of change of the growth at any time appears to be proportional to the size at that time. The mathematical treatment of these situations is somewhat simpler if a different number, called e, which is an irrational number approximately equal to 2.71828, is used as a base for a system of logarithms. Although any number larger than one would yield a similar system of logarithms, the base 10 and the base e are the bases of the two systems of logarithms which are in actual use. If a logarithm of a number in either system is known, the logarithm of the number in the other system can be found readily by means of the formula $\log_e x = \log_{10} x / \log_{10} e$.

Baseball (*bās′bạl*), an athletic game regarded as the national pastime in the U.S., which evolved from the British game of rounders. Its earliest American variety, widespread in the northeastern U.S. at the start of the 19th century, was town ball, in which there was no set number of players per team, but in which a bat, ball, and bases formed elements of play. Abner Doubleday (1819-93 is credited with inventing the game of baseball in 1839 at Cooperstown, N.Y. Alexander Cartwright, Jr. (1820-92), of the old Knickerbocker Baseball Club of New York, is referred to as the father of modern baseball for his having devised the rules for the first formal match game in history. This contest was played on June 19, 1846, between the Knickerbocker Club and the New York Nine (the latter winning by 23-1). Though both clubs were from New York City, they played at the Elysian Fields, Hoboken, N.J.

The Cartwright version of baseball—with nine men on a side, four bases, three strikes out, and three outs per inning—spread in popularity during the 1850's, supplanting town ball. Northern soldiers who were captured in the Civil War played baseball in the prison camps and thus helped spread the new game to the South.

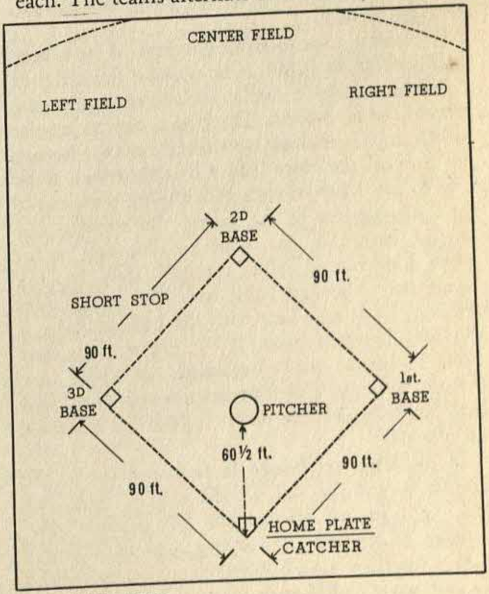
In the late 1860's, in Cincinnati, a former star cricket player named Harry Wright gathered the first totally professional team, called the Red Stockings. They toured the country, won all their games, showed a small profit, and—most important of all—proved the feasibility of professional baseball. Two years later, nine teams formed the first *major league,* called the National Assn. of Professional Base Ball Players. This National Assn. lasted only five years, because of the scandals arising from flagrant gambling on the games. In 1876 the National League was formed.

In the later 19th century, there were many "wars," in which the National League was challenged by rival major leagues. The only rival to last, however, was the American League, formed by Byron Bancroft (Ban) Johnson, a Midwestern newspaperman, in 1901. The American and National have been the two major leagues since that time, except for a two-year span (1914-15) when the Federal League raided them for star players and operated as a so-called outlaw league.

In addition to the two major leagues, modern professional baseball's structure includes dozens of minor leagues, of different gradations, according to the size of the city represented and the caliber of the players representing the individual city. There are close working agreements between the major and minor leagues, since the minors serve as training units for future major talent. There is also intensive interest in baseball in the colleges and nonorganized (that is, amateur and semiprofessional) fields of various cities. One of the fastest-growing sports movements in America has been Little League Baseball, played by boys ranging from 8 to 12 years of age and enrolling more than 250,000 players annually.

Partly as the result of foreign trips made by American players, baseball has become popular in other areas, notably Latin America and Japan.

Baseball is played by two teams of nine players each. The teams alternate on offense (or "at bat")



BASEBALL FIELD

Although the dimensions indicated in the diagram are fixed, the distance from infield to outfield varies with the individual playing field and defense ("in the field"). The basic playing area is the infield, laid out in a square-shaped pattern (see accompanying diagram). The offensive team sends one batter at a time to the striking position, alongside home. Each member of the defensive team wears a glove, to aid him in catching the hard, 5-oz., 9 in. in circumference, ball.

The key defensive player, the pitcher, stands in the middle of the square (called the "diamond") and throws the ball in an attempt to get it in the strike zone (over the plate laid at the home corner of the square and between the batter's knees and shoulders). If the batter fails to hit the ball with his bat (which is a modified wooden pole, averaging 34 in. in length and 34 oz. in weight), the ball is caught by another defensive player stationed in back of him, called the catcher.

The other seven defensive players, besides the pitcher and catcher, are dispersed in the field. Starting with home plate and going counterclockwise, the corners of the infield square are labeled first base, second base, and third base. The first baseman stands a few yards to the left of first base; the second baseman, several yards to the right of second; the shortstop, about halfway between second and third bases; and the third baseman, several yards to the right of third. The three outfielders stand about 300 ft. from home: the one who is practically in line with batter and shortstop is called the left fielder; the one in line with batter and second base, the center fielder; and the one between first and second, the right fielder.

The batter tries to strike the ball. If he misses three swings, he is out. If he does hit the ball, but a defensive player catches it before it hits the ground, he is also out. The batter tries to hit the ball in such a manner and direction that he can run around the bases before it is retrieved. If he fails to hit it far enough to complete a round of the four corners of the infield, he stops at the nearest base. He can continue running again when a teammate drives the ball fairly, but the baserunner is always liable to be put out if a defensive player tags him with the ball while he is standing between bases. If the pitcher fails four times to throw the ball through the strike zone before the batter either strikes out or hits the ball into fair territory, the batter is awarded first base on a walk.

In pitching, technique is as important as the ability to get the ball in the strike zone. The leading types of pitches are fast pitches, slow pitches, and curves of varying degrees. A curve ball thrown by a right-handed pitcher will twist away from a right-handed batter. The screw ball, another type of curve, moves in to a right-handed batter from a right-handed pitcher. The bend in the pitch is the result of snapping the wrist before letting go of the ball, thus making the ball spin.

Associated Press Photo

DOUBLE PLAY IN PROCESS

As the runner is forced out at second, the second baseman pivots to relay the ball to first for completion of the play

The offensive and defensive teams switch their roles after three outs. An inning includes one turn at bat and one in the field for each team. The team whose players have made more circuits of the bases (or "runs") at the end of nine innings wins the game. In case of a tie score, extra innings are played.

The 16 clubs comprising the two major leagues (American and National) play one another—within their own league—during a scheduled 154-game-per-team season. The team with the highest winning percentage at the close of the day listed as the last day of the season "wins the pennant" or championship in each league. The two pennant winners then meet in a series of games called the World Series (*q.v.*), and the first team to win four games is the world champion.

All rules in baseball are written out in the official rule book. A staff of umpires oversees each game with the main duty of making sure that the rules are carried out. Each of the major leagues has a crew of 16 umpires. Normally, four umpires work in each game: one situated behind the plate to call the pitches, the others

Associated Press Photo

SAFE AT HOME

The runner scores, sliding home as the catcher (*right*) waits for the ball, the umpire watches the runner, and the next batter (*left foreground*) waits his turn

located near first, second, and third bases.

Elections to the Baseball Hall of Fame began in 1936. The National Baseball Hall of Fame and Museum were dedicated in 1939, the 100th anniversary of baseball, in Cooperstown, N.Y. The museum contains historical records and pictures, bats, balls, and other relics of the sport. In addition to the players listed below, the following nonplaying "immortals" were elected: Edward G. Barrow (1953), veteran club manager; Sen. Morgan G. Bulkeley (1937), first president of the National League; Alexander J. Cartwright, Jr. (1938), father of modern baseball; Henry Chadwick (1938), pioneer baseball sports writer; Thomas H. Connolly (1953), American League umpire for 52 years; Byron B. (Ban) Johnson

BASEBALL HALL OF FAME

Name and Position Played	*Batting Average*[1]	*Year Elected*
Adrian C. (Cap) Anson (1st baseman)	.339	1939
John F. (Home Run) Baker (3rd baseman)	.308	1955
Roger P. Bresnahan (catcher)	.279	1945
Dennis (Dan) Brouthers (1st baseman)	.345	1945
Jesse C. Burkett (outfielder)	.342	1946
Max George Carey (outfielder, manager)	.285	1961
Frank L. Chance (1st baseman)	.297	1946
Fred C. Clarke (outfielder)	.315	1945
Tyrus R. (Ty) Cobb (outfielder)	.367	1936
Gordon S. (Mickey) Cochrane (catcher)	.320	1947
Edward T. Collins (2nd baseman)	.333	1939
James J. Collins (3rd baseman)	.294	1945
Charles A. Comiskey (1st baseman)	.269	1939
Samuel E. (Wahoo) Crawford (outfielder)	.309	1957
Joseph E. Cronin (shortstop)	.302	1956
Edward J. Delahanty (outfielder)	.346	1945
William M. Dickey (catcher)	.313	1954
Joseph P. DiMaggio, Jr. (outfielder)	.325	1955
Hugh Duffy (outfielder)	.330	1945
John J. Evers (2nd baseman)	.270	1946
William B. (Buck) Ewing (catcher)	.311	1939
James E. (Jimmy) Foxx (catcher, 1st baseman)	.325	1951
Frank F. Frisch (2nd baseman)	.316	1947
Henry L. (Lou) Gehrig (1st baseman)	.340	1939
Charles L. Gehringer (2nd baseman)	.321	1949
Henry B. Greenberg (1st baseman, outfielder)	.313	1956
William R. Hamilton (outfielder)	.344	1961
Charles L. (Gabby) Hartnett (catcher)	.297	1955
Harry E. Heilmann (outfielder, 1st baseman)	.342	1952
Rogers Hornsby (2nd baseman)	.358	1942
Hugh A. Jennings (shortstop)	.314	1945
William H. Keeler (outfielder)	.345	1939
Michael J. (King) Kelly (catcher, outfielder)	.313	1945
Napoleon (Larry) Lajoie (2nd baseman)	.339	1937
Cornelius McG. (Connie) Mack (catcher)	.249	1937
Walter J. V. (Rabbit) Maranville (shortstop)	.258	1954
Thomas F. McCarthy (outfielder)	.294	1946
John J. McGraw (3rd baseman)	.334	1937
James H. O'Rourke (outfielder, catcher)	.315	1945
Melvin T. (Mel) Ott (3rd baseman, outfielder)	.304	1951
Jackie Robinson (2nd baseman)	.311	1962
Wilbert (Uncle Robbie) Robinson (catcher)	.280	1945
Edd Roush (outfielder)	.323	1962
George H. (Babe) Ruth (outfielder, pitcher)	.342	1936
Raymond W. Schalk (catcher)	.253	1955
Aloysius H. (Al) Simmons (outfielder)	.334	1953
George H. Sisler (1st baseman)	.340	1939
Tristram E. (Tris) Speaker (outfielder)	.344	1937
William H. Terry (1st baseman)	.341	1954
Joseph B. Tinker (shortstop)	.263	1946
Harold J. (Pie) Traynor (3rd baseman)	.320	1948
John P. (Honus) Wagner (shortstop)	.329	1936
Roderick J. Wallace (3rd baseman, shortstop)	.267	1953
Paul G. Waner (outfielder)	.334	1952
Zachariah D. Wheat (outfielder)	.317	1959
George Wright (shortstop)	.251	1937
William H. (Harry) Wright (manager, pitcher)	.278	1953

PITCHERS

Name	*Games Won*	*Games Lost*	*Year Elected*
Grover C. Alexander	373	208	1938
Charles A. (Chief) Bender	212	128	1953
Mordecai P. (Three-Fingered) Brown	239	130	1949
John D. Chesbro	199	128	1946
William A. (Candy) Cummings	145	92	1939
Jay H. (Dizzy) Dean	150	83	1953
Robert Feller	266	158	1962
Clark C. Griffith	236	139	1946
Robert M. (Lefty) Grove	300	141	1947
Carl O. Hubbell	253	154	1947
Walter P. Johnson	414	280	1936
Theodore A. Lyons	260	230	1955
Christopher (Christy) Mathewson	373	188	1936
Joseph J. (Ironman) McGinnity	247	142	1946
Charles A. (Kid) Nichols	360	202	1949
Herbert J. (Herb) Pennock	241	163	1948
Edward S. Plank	325	190	1946
Charles G. (Old Hoss) Radbourne	308	191	1939
George H. (Babe) Ruth	92	44	1936
Albert G. Spalding	252	68	1939
Arthur C. (Dazzy) Vance	197	140	1955
George E. (Rube) Waddell	193	140	1946
Roderick J. Wallace	24	21	1953
Edward E. Walsh	195	126	1946
Denton T. (Cy) Young	511	315	1937

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[1] The percentage of hits per time at bat which is determined by dividing the times at bat into the number of hits.

(1937), founder of the American League; William J. Klem (1953), National League umpire for 46 years; Judge Kenesaw M. Landis (1944), first baseball commissioner; and Joseph V. McCarthy (1957) and W. McKechnie (1962), veteran managers.

Basedow (*bä'zẹ-dō*), JOHN BERNHARD, educational reformer, born in Hamburg, Germany, Sept. 11, 1723; died in Magdeburg, July 25, 1790. He studied at Leipzig and in 1753 became a professor in the academy at Soröe, Denmark. In 1761 he was transferred to the gymnasium at Altona, where he became involved in a severe controversy with several theologians because of his books raising questions against the orthodox faith. The foundation of the educational institution which became famous in history as the Philanthropinum was laid in 1774 at Dessau, Germany. The purpose of this institution was to supply a model school in which the principles of elementary work could be worked out in practical methods. As an organizer he did not prove successful, but teachers from his institution were scattered through Germany and applied in various ways the principles of the founder. He published "Book of Methods," "Pedagogical Conversations," and "Address to the Philanthropists and Men of Property."

Basedow's Disease, commonly known as exophthalmic goiter, toxic goiter, or hyperthyroidism. It was first described by Karl von Basedow (1799-1854), a German physician. See also *Graves' Disease; Thyroid.*

Basel (*bä'zẹl*), or BÂLE, a city and canton of Switzerland. The canton, divided into the two cantons of Basel-Country (Basel-*Land*) and Basel-City (Basel-*Stadt*), has a total area of 187 sq. m. and a population of approximately 265,000. It borders on Alsace and the inhabitants are German-speaking Swiss. The city of Basel, capital of the Basel-City canton, is one of the largest in Switzerland, situated 43 m. N. of Berne, on both sides of the Rhine; the two parts are connected by a number of bridges. These two parts are known as *Grossbasel* and *Kleinbasel.* The city occupies a site about 800 ft. above sea level. It is the seat of a cathedral founded in the 11th century, which contains the grave of Erasmus. It has a university, founded in 1460, with which are affiliated an institute of natural sciences and the botanical gardens. Among the city's noted buildings are the museum and picture gallery, the Bible Institute, the city hall, and the Church of St. Elizabeth. The manufactures include chemicals, drugs, silk, ribbons, machinery, leather, paper, spirituous liquors, and clothing. Basel is a railway center and one of Europe's largest inland ports. A Roman military post in the 4th century, it was then known as Basilia. In the 10th century it became a free city, and it was joined to the Swiss Confederation in 1501. Population, 1950, 183,543.

Basel, COUNCIL OF, the last of the three great ecclesiastical councils convened in the 15th century, held at Basel, Switzerland, 1431-49. The first of these councils was held at Pisa, Italy, in 1409, and the second at Constance, Switzerland, 1414-18. The council of Basel was called by Pope Martin V, who died shortly after its convocation; he was succeeded by Eugenius IV. Its objects were to deliberate with the intention of extirpating heresies and to discontinue wars among Christian princes. However, the council got into disputes with the Pope, deposed him, and elected Felix V in his stead. At the death of Eugenius IV, Nicholas V succeeded to the pontificate and brought about a reconciliation, which resulted in the abdication of Felix V and the official sanction of the decrees of the council of Basel. Final adjournment was agreed upon on May 4, 1449.

Base Line, in surveying, a line measured with precision and used as the basis for government

BASEL, SWITZERLAND

The Munster, or cathedral, rises above the Rhine River to dominate the city. Begun in 1019 and rebuilt after an earthquake in 1356, the great church was the scene of the Council of Basel (1431-49) (*Swiss National Tourist Office Photo by Giegel*) surveys, from which townships are numbered. Ranges are numbered east and west of prime meridians.

Basil (*băz'ĭl*), a plant of the genus *Ocimum*, particularly the sweet basil (*Ocimum basilicum*), native to the warmer regions of the Northern Hemisphere. Sweet basil, cultivated for its leaves (which are used as a seasoning), grows about 1 to 2 ft. tall, with white or purplish flowers, appearing in whorls of six, and ovate, often toothed leaves, 1 to 2 in. long.

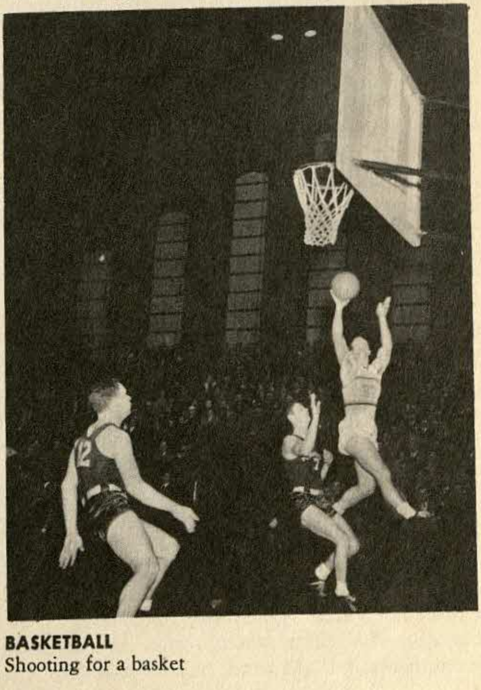
Basilica (*ba̤-sĭl'ĭ-ka̤*), in architecture, an oblong hall, originally Roman, adapted for use as a Christian church (*q.v.*) or cathedral (*q.v.*). See also *Architecture*.

Basilisk (*băz'ĭ-lĭsk*), in fable, a creature variously represented to resemble a serpent, lizard, or dragon, and reputed to possess a fatal breath. In modern zoology, the name is applied to a small reptile with four feet, a long tail, and a broad, membranous hood at the back of the head. These animals inhabit tropical regions, especially Central and South America, where they live near or in the water. They swim and climb trees with ease. Some species attain a length of 30 in. They are hunted for food in the West Indies.

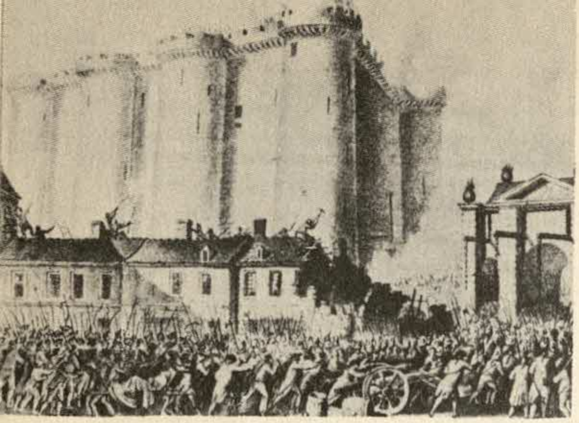
Basil the Great (*băz'ĭl*), SAINT, born in Caesarea, Asia Minor, about 330; died Jan. 1, 379. After he finished his education in Constantinople and Athens, he traveled extensively in Syria and Egypt, where he visited the famous hermits. Later he retired for study and contemplation at Iris, in Pontus, where he gathered a number of followers and sympathizers. In his religious faith he was orthodox, an opponent of Arianism (*q.v.*). Although opposed by certain factions, he was elected to the bishopric of Caesarea. Among the foremost Fathers of the Church, he was one of the founders of Eastern monasticism (Basilian monks). The Basilian liturgy, containing the form of celebrating the Eucharist, was established at the end of the 4th century and is still in use in the Greek Church. Saint Basil's day is June 14; his attribute is the dove.

Basin (*bā'sĭn*), a term used to describe any depressed or largely enclosed area in which waters, soils, or sea-bottom sediments accumulate. Basins are made by most of the large-scale forces that affect the earth's crust, such as the rise of continents and mountain ranges. The forces of running water and advancing glacial ice also create basins, as in the case of the Mississippi and Missouri River basins. Most of the lakes of the northern U.S. and Canada are basins that came into being when advancing glacial ice scooped out the pre-existing soil, and occasionally pushed it across the courses of streams to close up and flood valleys.

Basketball (*bås'kĕt-ba̤l*), a popular game primarily played indoors with a ball thrown by hand into goals. The playing court is a rectangular hardwood surface of maximum dimensions of 94 ft. in length by 50 ft. in width and minimum dimensions of 74 by 42 ft. At each end of the court are backboards which face the court and serve as a rebound medium which enables the ball to bank off the backboard into the basket. The baskets consist of metal rings 18 in. in inside diameter and with white cord nets, 15 to 18 in. long, suspended from the rings. The upper edge of the basket ring is 10 ft. above, and parallel to, the floor. The ball is spherical, leather-covered, and not more than 30 and not less than 29½ in. in circumference. The game is played by two teams of five players each; the purpose of each team is to throw the ball into its own basket, guarded by the opposing team, and to prevent the other team from securing the ball or scoring. The ball may be passed, thrown, batted, rolled, or dribbled (by consecutive motion of the hand batting the ball against the floor), but it cannot be kicked or carried. Two referees supervise the game. The ball is put into play at the start of the game and at the start of the second half by a referee's throwing the ball up in the center of the floor between single players from each team, each of whom attempts to bat the ball to a teammate. After each score, the defending team puts the ball into play from behind the end boundary line. The game, under college rules, is divided into two halves, each of 20 minutes' duration. In case of roughness, holding, hacking, or other physical contact designed to prevent a player from pro-



BASKETBALL
Shooting for a basket



STORMING THE BASTILLE, July 14, 1789

gressing with the ball or shooting at the basket, a foul is called and the offended player is permitted one or two free throws (two permitted if the foul occurred while he was shooting) at a distance 19 ft. from the basket. A goal from the field counts two points, from the free throw line, one point.

Basketball was invented by James Naismith at Springfield Coll., Springfield, Mass., in 1891. Official rules are drawn by the National Basketball Committee, composed of representatives from the National Collegiate Athletic Assn., the Amateur Athletic Union, the National High School Federation, the Y.M.C.A. and the Canada Basketball Assn. The game requires speed, quick reflexes, endurance, and mental alertness. Equipment includes sleeveless shirts, short pants, and specially-designed rubber-soled shoes. Knee pads, once popular, are now worn only about half the time.

Basques (*bȧsk̦s*), a peculiar race of people which probably occupied the whole Iberian Peninsula at a remote date. At present the Basques are confined to the Spanish provinces of Biscay, Alava, Guipuzcoa, and Navarre, and the department of Basses-Pyrénées of France. The total number in Spain and France aggregates about 600,000. Their language, known as the Basque language, has no close affinity with any European tongue. They are considered descendants of the people of ancient Iberia. Their industries are chiefly agriculture, mining, and fishing. They are fond of music and are known for their singing and dancing. The name *basque* is applied to a woman's waist which is fitted and extends over the hips.

Bas-Relief (*bä-rê-lēf′*), in sculpture, a kind of art work in which the figures project slightly from the background. In this style the height is about equal to half of the thickness of the figure, but in many sculptures of the 16th century the Italian artists had the figures project very slightly. The palaces of Assyria had bas-relief work set in alabaster, and in the halls were elaborate figures representing their deities and scenes of war and hunting. Bas-reliefs are common in Egyptian monuments, but the most famous examples are those which form the frieze of the Parthenon at Athens. *Cavo-relievo* is a kind of bas-relief in which the whole figure is set below the general surface, and the relief is in a sunken panel.

Bass (*bȧs*), a strong active game fish. The name is applied to widely different fishes of the perch family. Among the common American varieties are the *rock̦ bass,* the *black̦ bass,* the *spotted bass,* and the *ruddy bass.* Different species of bass are found both in the sea and in fresh water. The usual weight is about two pounds.

Bassano (*bȧs-sä′nō*), GIACOMO DA PONTE, painter, born in Bassano, Italy, in 1510; died in 1592. Taught by his father, he also studied the designs of Titian and others. His works consist largely of landscapes, flowers, portraits, and historical pieces. His son Francisco (1548-91) was also a painter of some note.

Basseterre (*bȧs-târ′*), a city of the British West Indies, capital of the island of St. Christopher, or St. Kitts. It has a good harbor and a trade in sugar and fruit. Population, about 10,000.

Basseterre, a town of the West Indies, capital of the French island of Guadaloupe, at the mouth of a small river. The harbor is poor, but the town has considerable trade. Population, *ca.* 14,000.

Bassett (*băs′ĕt*), JOHN SPENCER, historian, born in Tarboro, N.C., Sept. 10, 1867, died in Washington, D.C., Jan. 27, 1928. Graduated from Trinity Coll., in North Carolina, in 1888, he received his Ph.D. from Johns Hopkins in 1894. He taught at Trinity Coll., 1893-1906, and at Smith Coll., 1906-28. He wrote and edited many historical books, and founded and edited the *South Atlantic Quarterly.*

Bassia (*bȧs-ē′ȧ*), the name of a genus of plants native to warm climates, including several species of trees valued for their fruit. The *Mahwa tree* of the East Indies is valuable for its timber, and oil is obtained from the seeds.

Bassora (*bȧs′sō-rȧ*), or BASRA, a commercial city of S.E. Iraq, capital of a vilayet of the same name, on the Shatt-al-Arab (a stream representing the junction of the Tigris and the Euphrates Rivers). The surrounding country produces rice, barley, wheat, and dates. The city has an important trade in coffee, drugs, rice, camels, and various manufactured articles. An ancient stone wall surrounds the entire city. Bassora is a link on the Baghdad railway line and has a modern airport. The British occupied the city in World War II in order to guard their positions in the Near East. Population, *ca.* 150,000.

Bass Strait, a channel north of Tasmania, which it separates from Australia. It is 120 m. wide and is studded with many islands. Flinders Island is on its eastern extremity and Kings Island on its western. The strait was discovered in 1798 by George Bass, a surgeon in the British navy.

Basswood. See *Linden.*

Bastia (*bȧs-tē′ȧ*), a seaport of Corsica, opposite the Isle of Elba, 80 m. N.E. of Ajaccio. Two harbors serve its trade in oil, leather, macaroni, and marble. Dye, soap, and wax candles are manufactured. It was founded in 1380 by the Genoese. Population, *ca.* 23,000.

Bastiat (*bäs-tyä'*), FREDERICK, economist, born in Bayonne, France, June 29, 1801; died in Rome, Dec. 24, 1850. He studied political economy and became an advocate of free trade, forming the acquaintance of Cobden and many free traders of England. He spoke and wrote copiously against the French protective system.

Bastien-Lepage (*bäs-tyăn' lē-pȧzh'*), JULES, painter, born at Damvillers, France, Nov. 1, 1848; died Dec. 10, 1884. He studied at Paris and Rome, making his first exhibit at the Paris Salon, 1874. His "Portrait of My Grandfather" was greatly admired. He painted portraits of Albert Wolff, Sarah Bernhardt, the Prince of Wales, and Gambetta on his deathbed. A famous painting is "Joan of Arc Listening to the Voices."

Bastille (*bȧs-tēl'*), a word formerly used in France for any strong castle defended by bastions, but now specially applied to the prison and citadel of Paris built by Charles V about 1370. This structure, though designed as a defense against the English, was used as a state prison for persons of rank. It had a capacity for 70 or 80 persons, and was used thus most during the reigns of Louis XIV and Louis XV. Those confined were rarely criminals, but rather people who had displeased the king and his associates. These included political offenders, scholars, advocates, and priests, who were often confined so long that they were entirely forgotten by the public. On July 14, 1789, the Bastille was taken by a mob; the next day it was completely destroyed. Its site is marked by a column in the Place de la Bastille. The *fall of the Bastille* is an important event in French history and marks the downfall of the old monarchy. Bastille Day, July 14, is now celebrated annually as a national holiday in France.

Bastogne (*bȧ-stō'n'y'*), a town in the province of Luxembourg, Belgium. In the 16th century Bastogne assumed an important commercial role as a trade center for the surrounding area. Later it became an important European market for the purchase of pure-bred horses and fine smoked hams. Although the trade in horses is no longer so active, the town is still known for its hams. Traces of its importance and wealth in medieval times may still be seen in the town gate and the tower of its church, both dating from the 12th century. Bastogne suffered heavily in World War II, when it was the advance front for the successful resistance of American armies against German troops during the battle of the Ardennes, in 1945. It was here that the American Brig. Gen. Anthony McAuliffe answered German Gen. von Rundstedt's demand for surrender with the famous one-word reply, "Nuts." Population, *ca.* 4,700.

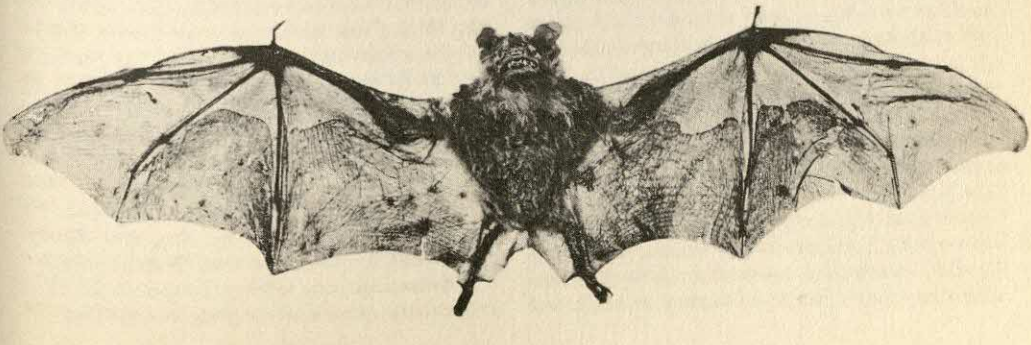
Basutoland (*bȧ-sōō'tō-lănd*), a British possession in South Africa, N.E. of Cape Colony. The area is 11,716 sq. m. It is bounded by the Orange Free State, Natal, East Griqualand, and Cape Province, and is drained largely by head streams of the Orange River. The region is well watered and has a fine growth of grasses and forests. The climate is healthful and well fitted for Europeans. Small coal fields exist here, but agriculture is the leading industry, the chief produce being livestock, wheat, and cereals. A large number of native Basutos work in gold mines.

The possession was annexed to Cape Colony in 1871, and placed under the authority of the crown in 1884. Its government is administered under the direction of a high commissioner for South Africa, through a resident commissioner; the legislative power of the former is exercised by proclamation. The colony has about 900 schools, at which in 1943 about 81,000 children of school age received instruction. Several highways have been constructed and there is communication with other South African countries by telegraph and railway. Maseru, the capital, has a population of 1,350. Population, *ca.* 600,000.

Bat (*băt*), an animal with wings composed largely of a thin, membranous skin, which is

VAMPIRE BAT

Courtesy Amer. Museum of Natural History, N. Y.



stretched from the fingers of the fore limbs and along the sides back to the hind limbs and tail. It moves about in the twilight and darkness and is the only mammal that can fly with facility. The bat is found in the temperate and warm regions, but attains its greatest size and is most numerous in the tropics. The bats of the temperate climate are mouselike in appearance, and, when stretched, their wings measure about 6 in. In the daytime they frequent caverns, hollow trees, crevices of ruins, and isolated lurking places, and at night come out to feed upon insects. During the entire winter season they sleep, except in warm climates. Many species sleep in daytime, hanging by their hind legs, head downward. Bats are more or less abundant in all countries, except in the extreme North and South. Some varieties are fruit-eating animals and live in orchards and vineyards, while others support themselves by sucking the blood of other mammals; this class is known as *vampire bats.* There are some 450 species of bats, but all are classed as mammiferous quadrupeds. They show great attachment for their young, even submitting to captivity rather than forsake them. The Australian *kalong* is the largest of the bats.

Bataan (*băt-än′*), rocky peninsula of Luzon Island, the Philippines, with Subic Bay in the west, South China Sea in the south, and Manila Bay in the east. Bataan Peninsula occupies a particular place in American history, for it was to this place, during World War II, a few weeks after the Japanese attacks on Pearl Harbor and Manila, that some 50,000 to 75,000 American and Filipino soldiers withdrew (Jan. 6, 1942) to make a last heroic stand against Gen. Masaharu Homma's 250,000 Japanese forces. The Americans and Filipinos, under Gen. Douglas MacArthur and Lt. Gen. Jonathan M. Wainwright, cut off from all Allied aid, were under constant Japanese attack and lacked weapons, food, and medical supplies. Finally, on April 9, 1942, they were forced to surrender. (A small force which succeeded in escaping across the channel to the fortress of Corregidor held out until May 6, 1942.) By April 15, the Japanese had rounded up the defeated men in detachments of about 1,000 each and forced them to march continuously day and night in the most deplorable physical conditions from Bataan to San Fernando, about 60 m. In the last stage of this "Death March," the men were herded into box cars and shipped 20 m., then marched 7 more m. to their final destination, Camp O'Donnell.

Batangas (*bä-täng′gäs*), a city of the Philippines, capital of a province of the same name, in Luzon, 52 m. s. of Manila. It is a seaport city of considerable importance and has a good harbor on Batangas Bay, an inlet from the Pacific. Among the chief buildings are the public library, a convent, and a palace. It has a large export trade and telegraph connections with interior and continental points. The manufactures include cigars, earthenware, clothing, and utensils. It was captured by the U.S. in 1899, in the war against the natives. Population of the province, 350,000; of the city, 40,000.

Batavia (*bȧ-tā′vĭ-ȧ*), or JAKARTA, a seaport city on the north coast of West Java, capital of the Republic of Indonesia. It is located on a large bay and is unhealthful, owing to its hot climate and low site. Europeans have improved the city by a system of drainage and by building the new part on a more elevated tract of land. The chief buildings include the post office, the Java Bank, the Exchange building, the museum and several Javanese temples. It has a large export trade in sugar, rice, coffee, tea, oil, indigo, and hides, principally with Holland. It was founded in 1619 by the Dutch, who improved it by building canals and an extensive harbor. A large per cent of the inhabitants are Chinese and Malays. Batavia was conquered by the Japanese (Mar. 1942), who surrendered in 1945; subsequently the whole island was occupied by the British, who were replaced to some extent by Netherlands soldiers, early 1946. After the defeat of Japan, the city gained prominence in the Indonesian movement for a republican government independent of the Netherlands (see *Indonesia*). Population, 1947, 1,127,000.

Batavia, county seat of Genesee County, New York, 36 m. E. of Buffalo, on the Lehigh Valley, the Erie, and the New York Central railways. It is surrounded by a productive agricultural country, and is the seat of manufacturing establishments producing implements, machinery, shoes, textiles, canned goods, plows, paper boxes, shoe polishes and dyes, flavoring extracts, and flour. A monument to William Morgan, noted for his connection with the anti-Masonic movement in 1826, stands in a public place. The city was founded in 1800. Population, 1950, 17,799.

Bate (*bāt*), WILLIAM BRIMAGE, soldier and legislator, born near Castalian Springs, Tenn., Oct. 7, 1826; died Mar. 10, 1905. He attended public schools and as a youth became clerk on a steamboat, and subsequently volunteered his services in the Mexican War, after which he practiced law and edited a newspaper at Gallatin, Tenn. His district elected him to the state legislature, and he was for a time attorney general for the Nashville district. At the beginning of the Civil War he joined the Confederate army as a private, attained to the rank of major general, and surrendered with the army of the Tennessee in 1865. Subsequent to the war he again practiced law, and served as governor of Tennessee, 1882-86. He was elected U.S. Senator in 1887, and was reelected in 1893, 1899, and 1905. Both as governor and Senator he was influential, and as the latter served on a number of important committees.

Bates (*bāts*), ARLO, educator and writer, born in East Machias, Maine, Dec. 16, 1850; died in Boston, Mass., Aug. 25, 1918. A graduate (1876) of Bowdoin Coll., he was editor of the Boston *Sunday Courant* (1880-93) and professor of English at Massachusetts Inst. of Technology (1893-1918). His works include novels—"Mr. Jacobs" (1883), "The Pagans" (1884), "A Wheel of Fire" (1885); poetry—"Sonnets in Shadow" (1887), "Told in the Gate" (1892); and collections of his lectures.

Bates, BLANCHE, actress, born in Portland, Ore., in 1873; died in San Francisco, Calif., Dec. 25, 1941. She made her stage debut in San Francisco in 1894 and later played Shakespearean and other roles with Augustin Daly's company in New York City. She created the leading roles in such plays as "Under Two Flags," "The Darling of the Gods," and "The Girl of the Golden West."

Bates, DAISY LEE, racial integration leader, born in Huttig, Ark., in 1920. She was educated at Philander Smith Coll. and Shorter Coll. in Little Rock, Ark. In 1941 she married L. Christopher Bates and with him founded and published the *Arkansas State Press,* a weekly newspaper devoted to the cause of racial equality. As Arkansas president of the National Assn. for the Advancement of Colored People (*q.v.*), she became a militant crusader, and in the 1957 school integration crisis in Little Rock she led the first nine Negro students into Central High School. She is the author of "The Long Shadow of Little Rock" (1962).

Bates, EDWARD, statesman, born in Belmont, Va., Sept. 4, 1793; died in St. Louis, Mo., Mar. 25, 1869. He secured a public school education and practiced law in Missouri, where he became attorney general of the state. He was a member of the state legislature, and in 1860, when Lincoln was nominated for President, he received much support for that office in the convention. After the election of Lincoln, Bates was chosen Attorney General of the U.S., but resigned in 1864.

Bates, ERNEST SUTHERLAND, biographer, historian, and educator, born in Gambier, Ohio, Oct. 14, 1879; died in New York, N.Y., Dec. 4, 1939. A graduate of the Univ. of Michigan (1902) and Columbia Univ. (1908), he was professor of English at the Univ. of Arizona (1908-15) and of English (1915-21) and philosophy (1921-25) at the Univ. of Oregon. He was editor of the "Dictionary of American Biography" (1926-29) and associate editor of *Modern Monthly* (1933-36). Among his many books are "This Land of Liberty" (1930), "Biography of the Bible" (1937), and "American Faith" (1940).

Bath (*bàth*), a city of Somerset, England, on the Avon River, noted for mineral water and baths. The mineral springs were known to the Romans, and remains of baths constructed by them in the 1st century A.D. have been found. The city is built largely of oölite stone obtained from quarries in the vicinity. Victoria Park contains 50 acres. Bath is also noted as an outstanding example of early town planning. The chief buildings are the Abbey Church, and the Guildhall. It is the seat of Bath Technical Coll., Kingswood School, and the Grammar School, founded in 1552 by Edward VI. Pop. (1947 est.), 77,010.

Courtesy Associated British & Irish Railways, Inc.

ROMAN BATHS IN SOMERSETSHIRE, ENGLAND

Bath, county seat of Sagadahoc County, Maine, on the Kennebec River, about 38 m. N.E. of Portland. It is on the Maine Central R.R. and has extensive navigation facilities. The manufactures include furniture, iron and leather wares, clothing, and machinery. The first settlement was made in 1660; Bath was incorporated as a city in 1847. Population, 1900, 10,477; in 1950, 10,644.

Bath, county seat of Steuben County, N.Y., 98 m. S.E. of Buffalo, in the Finger Lakes region. It is served by the Lackawanna and Erie R.R.'s. Its manufactures include ladders, iron pipe, silks, lumber and dairy products, harness, and clothing. The surrounding country is a rich agricultural area, principal industries of which are dairying, grape culture, and potato and wine production. The chief buildings are a U.S. Veterans' Administration hospital and a municipal building. The site was developed by Charles Williamson in 1793 for the Pulteney Estate, at a cost exceeding $1,000,000. Population, 1950, 5,416.

Bathing (*bāTH'ing*), the immersion of the body, or a part of it, in water for the purpose of maintaining cleanliness and stimulating health. It was a part of the religion of many ancient nations, including the Egyptians, Hebrews, and Greeks. The Koran makes it mandatory for Mohammedans to wash the face, hands, and feet five times a day. This command is observed so carefully that when the Moslem is in a desert and out of the reach of water the ceremony is performed with sand. The Romans built the most splendid baths constructed by the ancients. In the time of Emperor Diocletian the Roman baths had a capacity sufficient for 18,000 persons to bathe at once, while Emperor Caracalla built baths nearly a quarter of a mile square. These structures were provided with washing rooms, courts for games, gymnasiums, hot and cold water baths, vapor baths, swimming baths, and hot-air baths, and their walls were decorated with marbles, statues, mosaics, and historic paintings.

Baths are variously designated from the character of the process to which the body is subjected. A *Turkish bath* is applied by admitting hot air into the room where the bather sits. The heat of the air is constantly increased until he perspires freely, when he goes into a washroom, where his body is briskly scrubbed with water and soap and cooled by a shower bath. He next plunges into a swimming bath of cool water, where he bathes freely, and, after emerging, he is dried, wrapped in a blanket, and lies down on a lounge until the natural warmth of the body returns. A *Russian bath* differs from the Turkish in that the hot air is displaced by hot steam, but in other respects they are similar.

A hot bath brings the blood near the surface, which reddens the skin. The effect of violent heat fatigues the body, hence hot baths should be carefully administered. It is preferable to take a lukewarm bath and increase the heat from time to time as the body becomes accustomed to it. A warm bath gives no shock to the bather and is always pleasant. It has a tendency to quiet the nerves and increase the flow of blood, and is the best form for most persons. A cold bath causes a sudden chill, and is followed by a feeling of warmth, which is called a *reaction*. The bather should remain in water only until he feels the reaction, when he should come out and rub himself dry with a coarse towel. None but the strong are able to endure a cold bath, but administered carefully it is beneficial. *Sea bathing* is one of the most pleasant and beneficial exercises for the body. The salt water seems to have a wholesome effect upon the skin and is stimulating, if the bather does not remain too long in the water.

Baths are usually known by the degree of temperature at which the water or vapor is administered. The average temperature of a cold bath is about 48°; cool bath, 58°; tepid bath, 88°; warm bath, 95°; and hot bath, 100°. In many cities mineral water flowing from the ground is utilized for bathing purposes. Some of the most noted mineral baths in Europe are at Baden-Baden and Aachen, Germany; Spa, Belgium; Karlsbad and Teplitz, Bohemia. The leading natural hot baths of North America are at Saratoga Springs, N.Y., Hot Springs, Ark., and Hot Springs, S.D. The water is both mineral and thermal, ranging in temperature from 100° to 160°. Thousands of people patronize these health resorts and indulge in bathing both for pastime and to regain lost health. Many physical ailments can be cured and the system can be greatly strengthened by the use of these natural remedies. Though bathing is generally healthful, a person should not remain too long in the water, and bathing within three hours after a heavy meal should be carefully avoided.

Bath, KNIGHTS OF THE, a military order in Great Britain, the largest in number and the highest to which a commoner can attain. It was so named from the ceremony of bathing, which was formerly practiced when a knight was initiated, hence indicated that both purity and chivalry were required. The order probably dates from the early part of the 12th century, and it is thought that it was instituted by Henry I, who is said to have made Geoffrey of Anjou and others "Knights of the Bath." It was used in the coronation of Charles II, in 1660, and later fell into disuse, but was revived by George I in 1725. At present it comprises three classes, Knights Grand Cross (G.C.B.), Knights Commander (K.C.B.), and Companions (C.B.).

Bathometer (*bȧ-thŏm′ē-tẽr*), an instrument to indicate the depth of water. It was invented by C.W. Siemens and is used on vessels, indicating the depth of the water below the ship or steamer. The instruments belonging to this class differ materially, ranging from the simpler forms used to measure shallows to the more complicated apparatus necessary to determine great depths. In general they depend upon the principle that underlies the law of gravitation, and that the attraction exerted by the land is stronger than that of water. The essential part is a vertical steel tube, at the lower end of which is a cup-shaped expansion, and the depth of the water is indicated on a micrometer scale as the mercury rises or falls in the tube. In some instruments oil or water is used instead of mercury. The column in the tube lowers in shallow water, since greater force is exerted in drawing down the mercury, and it rises in deeper water to the extent that the force is diminished. A sounding line is used to sink the instrument to the bottom. The bathometer has been replaced in modern ships by the use of electronic waves on the radar principle.

Bathsheba (*băth-shē′bạ*), the wife of Uriah. King David fell in love with her and ordered Uriah into battle, where he was killed (II Samuel, 11). David married Bathsheba, who became the mother of Solomon (II Samuel, 12:24).

Bathysphere (*băth′ĭ-sfẽr*). See *Diving*.

Batista (*bä-tēs′tä*), FULGENCIO (in full, FULGENCIO BATISTA Y ZALDÍVAR), ex-president of Cuba, born in Oriente Province, Cuba, Jan. 16, 1901. He entered the Cuban army as a private in 1921 and ten years later joined the revolt against the Machado government. In 1933 Pres. Céspedes was ousted, and Batista became colonel in command of the Cuban army. He assumed control of the government and instituted the impeachment of Pres. Gómez in 1936. He approved the latter's successor, Brú, and was himself elected president in 1940, a post he held till 1944. In 1952 he regained power by a *coup d'état,* overthrowing Pres. Socarrás. He soon ruled dictatorially, and a popular revolt, led by Fidel Castro, spread through the land, beginning in 1956. Batista was ousted on Jan. 1, 1959.

Baton Rouge (*băt'ŭn rōōzh'*), the parish seat of East Baton Rouge parish, and capital of Louisiana, on the east bank of the Mississippi River, about 90 m. by railroad and 130 m. by river from New Orleans. It is on the Missouri Pacific, the Illinois Central, and the Arkansas & Louisiana-Kansas City Southern R.R.'s. Situated 25 m. above the highwater mark, the city is the farthest inland deep-water port for export trade on the Mississippi, as well as the center of the South's chemical and petroleum industry. Baton Rouge is the seat of the Louisiana State Univ. and Agricultural and Mechanical Coll., Southern Univ. and Agricultural and Mechanical Coll. (for Negroes), and schools for the blind and deaf. Prominent buildings include the state capitol, the courthouse, the post office, and the city hall. Founded by the French, Baton Rouge was the state capital from 1848 to 1864. The seat of state government was moved to New Orleans in 1864, but back to Baton Rouge in 1880. The Union army occupied the city in the Civil War. In 1900 the population was 11,269. The decade of greatest growth was 1940-50, which saw an increase from 34,719 to 125,629. In 1960 the population was 152,419.

Battalion (*băt-tăl'yŭn*), a tactical unit of a military force, usually made up of a headquarters company and three or more companies, batteries, or similar organizations. It may be part of a regiment, but separate battalions exist that are administrative as well as tactical units. A battalion is normally commanded by a major or lieutenant colonel. A *company,* commanded by a captain, is made up of four platoons; a *platoon,* commanded by a 1st or 2nd lieutenant, of two sections; a *section,* under a sergeant, of two squads; and a *squad,* led by a corporal or sergeant, constitutes the smallest basic unit.

Battenberg (*băt'n-bĕrg*), name of a German princely family, derived from a town in Hesse-Nassau. The title died out in 1314, but was revived in 1851, when Prince Alexander of Hesse conferred it upon his wife. It was their eldest son, the Marquis of Milford Haven, who, in 1917, during the anti-German feelings of World War I, anglicized the name of the English branch of the family; hence *Battenberg* in translation became *Mountbatten.* Other members of the family were Alexander I, prince of Bulgaria; Prince Henry of Battenberg, who married Beatrice, youngest daughter of England's Queen Victoria; and Victoria Eugénie, who married Alfonso XIII of Spain. See also *Mountbatten, Lord Louis.*

LOUISIANA STATE CAPITOL AT BATON ROUGE

Battering-Ram (*băt'tĕr-ĭng-răm*), an ancient war machine used to batter down walls of forts and cities. It consisted of a great wooden beam with a heavy bronze or iron head. The length was from 50 to 180 ft., and the large metal head often weighed a ton. Many were built in frames, while others were on rollers or wheels with a cover over the front to protect the workers from falling missiles. The work of the ram was effected by about 100 men, or by the use of ropes and pulleys. It was regarded as an essential implement in the time of the ancient Greeks and Romans, who employed it extensively while laying siege to fortified cities.

Battery (*băt'tĕr-ȳ*), military, the basic artillery unit, usually two or more guns under a single command. The term is also used as a military designation for any emplacement where artillery is mounted. The six-gun battery is one of the important units of the present-day armored artillery. In the Navy the term is used to designate all of a warship's guns, or certain groupings of guns aboard ship, such as the "starboard battery" (see also *Artillery*). For battery in legal terminology, see *Assault and Battery.*

Battery, ELECTRIC, a combination of apparatus used for the storage and production of electrical energy through chemical means.

Formerly the term was used in connection with the Leyden jar (*q.v.*) which discharges all of its energy practically instantaneously. Nowadays, the term battery implies a device which generates electrical current over a period of time.

Batteries are now divided into two groups: the primary and the secondary. The difference between the two is that the secondary battery can be recharged after it has been used while the primary cannot.

The cell is the basic unit of a battery. Batteries may consist of one or more cells. The quantity of current which can be produced by a cell depends upon the amount of material used in the construction. However, the voltage of any type of cell can not exceed 2.5 volts, regardless of the cell's size. Current produced by both primary and secondary cells is direct current.

Batteries come in a variety of shapes and sizes. They can be cylindrical like the flashlight battery or cubical like the car battery.

Alessandro Volta (*q.v.*) made the first primary battery in 1800 by putting copper and zinc into a jar containing an electrolyte of acetic acid. This battery was rather crude when compared with present-day standards, but it established the basic chemical principles involved in the production of an electric current. It was not until 1888 that a primary battery which was readily portable and more convenient to handle was developed. Dr. Gassner, who produced this battery, used the zinc as a container for the other elements. Inside the container, the electrolyte was dissolved in a porous substance, and the whole unit was sealed across the top. In 1890, the commercial production of dry primary batteries began.

Primary batteries generate a current through the chemical consumption of the zinc. When this material and the electrolyte become exhausted after use, the whole unit has to be replaced. Primary cells usually generate anywhere from .9 to 1.6 volts. The voltage depends upon the amount of use the battery has seen and the condition of the materials in the cell's construction. These dry cells are used in flashlights, hearing-aid devices, and portable radio sets.

The advent of mechanical generating equipment created a need for storing electrical energy. Gaston Planté (1834-89), of France, had already designed the first practical storage battery which used lead plates immersed in dilute sulfuric acid (1859). Later, Thomas Alva Edison (*q.v.*) succeeded in producing the first nickel-iron-alkaline storage battery (1908).

The secondary cell or storage battery, of which the car battery is an example, has to be charged before it can be put into operation. The chemical reactions in the secondary cell are reversible, thus permitting it to be continually recharged. This battery produces slightly over two volts per cell.

The three types of storage cells are the lead-acid, the nickel-iron-alkaline, and the nickel-cadmium-alkaline cell. A cell consists of two kinds of plates (positive and negative) in the electrolyte solution. In the lead-acid cell the electrolyte is dilute sulfuric acid, and the plates are lead.

Storage batteries are used to supply electricity when mechanical devices fail and also to supplement generating equipment. They are used in practically every important industry in the world because of their flexibility and reliability. See also articles on electrical subjects in volume IV.

Battle (*băt′t'l*), a combat between two or more armies, or divisions of armies. Battles are fought either with the view of attaining local advantage, or influencing favorably the whole contest. The skilful commander aims to reach a decisive point in each engagement. This is *strategy,* while skill in active battle is called *tactics.* Each victory must be followed up in order fully to disable the beaten army and thereby gain the advantage of success. Battles do not depend upon their magnitude for importance, but rather upon their enduring effect upon social and political conditions. Sir Edward Creasy (1812-72), in "Fifteen Decisive Battles of the World" (1851), listed "those few battles of which a contrary event would have essentially varied the drama of the world in all its subsequent scenes." Creasy's list follows:

B.C.	490.	Battle of Marathon.
	413.	Defeat of the Athenians at Syracuse.
	331.	Battle of Arbela.
	207.	Battle of the Metaurus.
A.D.	9.	Defeat of the Romans under Varus.
	451.	Battle of Châlons.
	732.	Battle of Tours.
	1066.	Battle of Hastings.
	1429.	Joan of Arc's victory at Orléans.
	1588.	Defeat of the Spanish Armada.
	1704.	Battle of Blenheim.
	1709.	Battle of Pultowa.
	1777.	Defeat of Burgoyne at Saratoga.
	1792.	Battle of Valmy.
	1815.	Battle of Waterloo.

In a 1943 edition of Creasy's book, the learned journalist, Robert H. Murray, supplements the original 15 battles with an additional nine of his own choosing:

A.D.	1522.	Battle of Tenochtitlan.
	1759.	Battle of Quebec.
	1824.	Battle of Ayacucho.
	1863.	Battle of Gettysburg.
	1863.	Defeat of Confederates at Vicksburg.
	1866.	Battle of Sadowa.
	1870.	Battle of Gravelotte.
	1870.	Battle of Sedan.
	1905.	Battle of Mukden.

Furthermore, in the two world wars, the first Battle of the Marne (1914), halting the Germans in their advance toward Paris; the Battle of Flanders (1940), which laid open to German assault the French countryside west of the Somme, forcing the English to evacuate the continent; and the months-long Battle of Stalingrad (Aug.-Dec. 1942), which bled white the German armies on the eastern front and contributed toward their ultimate rout from Russian territory, as well as the Allied breakthrough at Caen and St.-Lô (July 1944), rolling back the German defense lines in France, all could be counted among "the decisive battles of the world."

In the Pacific theater of World War II, the Allied victories in the battles of the Coral Sea (May 4, 1942), Midway (June 4, 1942), Bismarck Sea (Mar. 2, 1943), Second Battle of the Philippines (Oct. 1944), and the air war over Japan (including the razing of Hiroshima by an atomic bomb) were decisive in the defeat of Japan.

Battle Abbey, spot in Sussex, England, where a monastery was built in 1067 by the Benedictines to commemorate the Battle of Hastings (1066), consecrated in 1094 and razed in the 16th century.

Battle Above the Clouds, so named because of its elevation, a phase of the Battle of Chattanooga, Nov. 23-25, 1863, in which Union Gen. Hooker forced Confederate Gen. Bragg's left flank, captured Lookout Mt., and made possible a concerted advance by Gen. Grant's Army of the Cumberland. Bragg retreated with 8,000 casualties.

Battle Creek, a city of Michigan, in Calhoun County, 120 m. w. of Detroit, served by the Grand Trunk and Michigan Central R.R.'s. The principal manufactures range from cereals and prepared foods to agricultural and heavy industrial equipment. The chief buildings are the U.S. Army's Percy Jones General Hospital and Battle Creek Sanitarium, founded by the Seventh-day Adventists. Fort Custer, a military training camp, and a Veterans Admin. Hospital are located at its outskirts. First settled in 1831, the city was incorporated in 1860. Population, 1950, 48,666.

Battleford (*băt't'l-fôrd*), a town in Saskatchewan, at the junction of the Battle and North Saskatchewan rivers; served by the Canadian National and Canadian Pacific Ry.'s. Once the capital of the Northwest Territory (1876-83), the town has an historic Northwest Mounted Police and Indian museum. Near it, Louis Riel (*q.v.*) organized an insurrection. It is surrounded by farms and ranches. Population, 1951, 1,319.

Battleship (*băt't'l-shĭp*), "ship of the line" of the old-time navies, a warship combining the ultimate in offense and defense. The modern battleship is a descendant of the two-deck, 74-gun, sailing battleship of the 18th century. Steam propulsion was first introduced into battleships in 1850, but only as an auxiliary to the sails. The inevitability of the universal application of steam was eventually recognized, however, and by the time of World War I (1914-18), all the major units of large navies were steam-propelled. With the steady increase in the effectiveness of guns and other weapons, particularly the torpedo (*q.v.*), corresponding improvements in armor became necessary. Construction of battleships has largely kept pace with the development of new weapons, and effective compromises of armor with speed and maneuverability have been maintained.

Floating batteries used at Gibraltar in 1782 may be termed the first armored battleships. The first seagoing armored battleship was designed by Col. John Stevens of New Jersey (1807), whose plans were never fully realized. The French, therefore, were the first to succeed in producing an armorclad, seaworthy battleship. Italy and England soon followed suit and the U.S. commissioned three armored vessels in 1861. Of these, the *Monitor* is best known. Not a seagoing vessel, but a floating battery, she was the first vessel equipped with a successful revolving turret. She fought to a draw (Mar. 9, 1862) with the Confederate ironclad *Merrimac* at Hampton Roads, during the American Civil War, in the first battle between ironclads. Armored battleships equipped with turrets soon became commonplace. The British vessel *Dreadnought* (1905) introduced the theory of large guns of uniform caliber, and also revolutionized battleship design. The *Dreadnought,* which gave its name to a new class of warships, was larger and more deadly than other battleships of its day, having a displacement of 17,900 tons and a primary armament of ten 12-in. guns. The dreadnought as a type came to be superseded by the even more powerful super-dreadnought.

In the U.S. Navy, battleships range in size from about 30,000 tons displacement to 45,000, with an over-all length from 600 ft. to 880 ft. The engines have horsepower ranging from 30,000 to 200,000, providing for speed up to 30 knots and over. Armament includes from 12 to 20 guns of 14- or 16-inch caliber, as well as antiaircraft. Many modern battleships are equipped to carry air-

BATTLESHIP. U.S.S. *MISSOURI*

Official Photograph U. S. Navy

PIERRE CHARLES BAUDELAIRE

craft. The complements generally number from about 1,350 to 1,500 men.

Despite the fact that many speak of the battleship as a weapon of the past in modern warfare, with its emphasis on air power, battleships have consistently proven themselves to be of inestimable value in waging war against enemy vessels of any type. In warfare, on the high seas, battleships are almost always accompanied by destroyers (*q.v.*) and aircraft carriers. The former provide protection due to their great maneuverability and firing power, while the latter supply the aircraft to fight off attacking enemy planes and aid in actual battle. See also *Pocket Battleship; Warships,* and color plate, *Fighting Ships Through the Ages,* Volume XI.

Batum (*bä-tōōm'*), chief city and port of Adzhar, autonomous Soviet Socialist Republic, on the eastern coast of the Black Sea. Noted as an exporting center for the oil which is brought to Batum by pipe and also by rail (by the Transcaucasian Railroad) from Baku (*q.v.*), the Black Sea port also has oil refineries, and exports of naphtha, raw silk, walnut, rosewood, manganese, wool, and maize. Transferred from Turkey to Russia in 1878, Batum, after World War I, was occupied by the Turks, the Russians, and the Allies in turn. After final evacuation of the troops in 1920, the city became a part of the Georgian Socialist Republic (1921). Population, about 70,000.

Baucis and Philemon (*bō'sĭs and fĭ-lē'mŏn*), in Greek mythology, the devoted peasant couple who offered hospitality to Zeus (Greek king of the gods) and Hermes (Greek messenger of the gods), who visited them in disguise. Zeus rewarded their kindness by changing their simple cottage into a temple and by granting them simultaneous death, after which they were transformed into trees.

Baudelaire (*bō-d'lâr'*), PIERRE CHARLES, poet, born in Paris, France, Apr. 9, 1821; died Aug. 30, 1867. After taking a degree at the Coll. Louis-le-Grand (1830) he turned to literary work.

Baudelaire is particularly noted for his belief in *corréspondance:* the unity of aesthetic perception. He believed that a relationship exists not only among the various arts, but among the various elements of life such as colors, sounds, and odors, and the impressions they evoke. He expressed his theory of aesthetics in his famous sonnet *"Corréspondances,"* one of the lyrics which appeared in his most famous book, *"Les Fleurs du Mal"* (1857). This volume, considered morbid and unwholesome by many, was suppressed until some of the "immoral" poems were removed, but an unexpurgated edition appeared in 1861. Baudelaire's concept of correspondences carried to its fullest development and application resulted in the symbolist (*q.v.*) school of French poetry as exemplified by Rimbaud, Verlaine, and Mallarmé.

Baudelaire himself was influenced to a considerable extent by the American writer, Edgar Allan Poe (*q.v.*). Baudelaire made an extensive study of Poe and spent a number of years working on two books concerned with him, *"Edgar Poe, sa vie et ses ouvrages"* (1852) and *"Notes nouvelles sur Edgar Poe"* (1857). He also wrote many criticisms of art, music, and French literature, writing studies of the work of Delacroix, Manet, Daumier, Gautier, Hugo, Flaubert, Balzac, de Nerval, and Wagner, among others.

Baudelaire was addicted to opium and to alcohol, and at the time of his death had been confined to an asylum for some time.

Baudry (*bō-drē'*), PAUL JACQUES AIMÉ, painter, born at La Roche-sur-Yon, France, Nov. 7, 1828; died in Paris, Jan. 17, 1886. He studied under Drölling in Paris and was awarded the Grand Prize in 1850. Subsequently he studied in Rome, where he was inspired by the works of great masters, and in 1875 became commander in the Legion of Honor. His decorations in the opera house in Paris are especially esteemed, and his "The Glorification of the Law" is considered a masterpiece of art. He painted works entitled "Toilet of Venus," "Fortune and the Child," and "St. John the Baptist."

Baumgarten (*boum'gär-tẹn*), ALEXANDER GOTTLIEB, philosopher, born in Berlin, Germany, July 17, 1714; died May 26, 1762. He studied at Halle and in 1740 became professor of philosophy at Frankfort-on-the-Oder. His works on aesthetics are considered authoritative, and he is regarded by some writers as the founder of the theory of modern aesthetics. His chief works are "Aesthetical Philosophy," "Metaphysics," and "General Philosophy."

Bautzen (*bout'sẹn*), a city of Germany, in the state of Saxony, on the Spree River, 32 m. N.E. of Dresden. It has railroad and electric railway facilities and manufactures of leather, textiles, and clothing. A cathedral, a castle, and the royal palace are among the chief buildings. It became a town in the 10th century, in the reign of Otho I, and suffered greatly during the Thirty Years' War. In 1813 it was the scene of a great battle when Napoleon, with an army of 130,000 men defeated an allied army of 90,000 Germans and Russians. Following World War II, it came under Russian occupation. Population, *ca.* 40,000.

Bauxite (*bôks′īt*), a white or grayish hydrate of alumina. It occurs in claylike masses and is usually discolored by impurities, such as iron, which gives it a red or brown color. It is a source of aluminum and is used for lining furnaces which are exposed to intense heat. Large deposits are found in France, Russia, and Italy. In the U.S. the principle sources are in Arkansas, Georgia, and Alabama.

Bavaria (*bȧ-vâ′rĭ-ȧ*), formerly a kingdom of the German Empire, and a state of the German Reich. The prewar state of Bavaria consisted of two parts: the western section, known as Rheinish Bavaria or the Palatinate, which became a part of the French occupation zone after World War II; and the eastern and largest section, the present-day state of Bavaria, which is part of the U.S. occupation zone. This section is bounded on the E. by Czechoslovakia and Austria, on the S. by Austria, on the W. by the states of Württemberg-Baden and Hessen, and on the N. by the states of Hessen and Thüringen.

PHYSICAL FEATURES. The surface is generally mountainous, and most of the boundaries are formed by mountain ranges, including the Bavarian Alps, which rise to their highest point at Mt. Zugspitze (9,719 ft.). The central part of the state is an elevated plateau, traversed by the Danube River and its tributaries, the Lech, Inn, Iller, Isar, Regen, Vils, and Wornitz. The northeastern section of the state is a low, fertile valley formed by the Main River, which flows west into the Rhine. Tributaries of the Danube and the Main are connected by the Ludwigs Canal. More than 40 per cent of the state is suitable for agriculture, and there are numerous fine forests. The climate is generally temperate, although there are severe winters in the more mountainous regions. Rainfall is heaviest in the eastern part of the state, averaging 75 in. annually. The area of the U.S.-occupied part of Bavaria is about 27,000 sq. m.

NATURAL RESOURCES. Since a large part of the state consists of forests, there are large returns from the sale of timber. The minerals are valuable, especially coal and iron, and there are deposits of salt, graphite, copper, manganese, clay, and building stone. The soil is noted for its fertility.

INDUSTRIES. Agriculture is the most important enterprise, and potatoes, rye, and wheat take the highest rank in the quantity produced. Other products include hay, oats, barley, sugar beets, hops, beer, wine, and rape seed.

The important manufactures include glassware, optical and scientific instruments, paper, textiles, leather, tobacco, earthenware, chemicals, and agricultural implements. Transportation for trade is provided by an extensive system of modern railroads (badly bombed during World War II), and by the Ludwigs Canal and the network of tributaries of the Main and Danube Rivers.

GOVERNMENT. As a constitutional republic (1918-33), Bavaria was ruled by a diet, consisting of one chamber, elected every four years. For the purpose of administration, the state was divided into the eight districts of Upper Bavaria, Lower Bavaria, Swabia, Upper Palatinate, Lower Franconia, Middle Franconia, Upper Franconia, and Palatinate. In 1935 the government of the state was under a single governor, directly responsible to Adolf Hitler (*q.v.*), and following the allied conquest of Germany the state became part of the West German federal republic (see *Germany*).

INHABITANTS. The inhabitants are almost exclusively German. About 33 per cent are Protestants and more than half of the entire population are Roman Catholics. Munich, the capital, is located on the Isar River. Augsburg, Nuremberg, Ratisbon, Bamberg, Erlangen, Baireuth, and Schweinfurt are the principal commercial centers. In 1905 the state had a population of 6,176,057; in 1946 the population within the U.S. zone numbered 9,029,000.

HISTORY. In ancient times the territory comprised in Bavaria was inhabited by Celtic tribes, known as the Boii, and the region was conquered by the Romans about the year 15 B.C. It became a possession of the Franks in the time of Charlemagne in the 8th century, and in 1070 was acquired by the Guelph family. The territory was transferred to Otho, Count of Wittelsbach, in the latter part of the 12th century, and its government had been administered by this family without intermission through 1918. Napoleon raised Bavaria to a kingdom in 1805, and the king aided France in the Napoleonic wars.

In 1866 Bavaria sided with Austria in the Austro-Prussian War and lost some territory annexed to it by Napoleon. When Napoleon III declared war against the North German Confederation in 1870, Bavaria joined Prussia and took a prominent part in the military movements against France. It was largely at the suggestion of the King of Bavaria that William of Prussia accepted the title of Emperor of Germany. A revolution overthrew the Wittelsbach dynasty, Nov. 7, 1918, and the Socialist Republic of Bavaria under Eisner and Hoffman was established, lasting until March 1920, when the government was established on a parliamentary basis. Adolf Hitler (*q.v.*) started his National Socialist movement in Bavaria and, in November 1923, he and Gen. Ludendorff tried to seize the government in an armed upheaval in Munich which was suppressed by military forces. After the surrender of Germany, 1945, Bavaria was occupied by the U.S.

Bavarian Succession, WAR OF THE, a war which followed the death of Maximilian Joseph of Bavaria, in 1777. Joseph II of Austria seized the opportunity to claim Bavarian lands for Austria. This move, secretly supported by Charles Theodore, heir of Maximilian Joseph, was opposed by Frederick the Great, who declared war and invaded Bohemia. Saxony supported Prussia. Catherine II of Russia was also hostile to Austria. The crown of Bavaria passed to Charles Theodore by the Treaty of Teschen, 1779, which ended the brief conflict, while Saxony received a money indemnity, and Austria gained the Innviertel.

Bax (*băks*), SIR ARNOLD E. TREVOR, pianist and composer, born in London, England, Nov. 8, 1883; died in Cork, Ireland, Oct. 3, 1953. He studied at the Royal Acad. of Music, London. Bax wrote in all major forms except opera, in a complex, somewhat romantic style, often influenced by Celtic legend. Among his symphonic poems were "Tintagel" (1917) and "November Woods" (1917). Knighted in 1937, he was appointed Master of the King's Musick in 1942.

Baxter (*băks′tĕr*), RICHARD, eminent divine of the 17th century, born at Rowton, England, Nov. 12, 1615; died in London, Dec. 8, 1691. He became chaplain in the Civil War of 1642, siding with the Parliament. His eloquence was brought in play against the execution of the king and in opposition to the election of Cromwell, and later he made a reputation as a minister and an able writer on theological topics.

Bay (*bā*), or BAY TREE, the general name of several trees and shrubs which resemble the laurel, and applied both to the fruit and the trees. The red bay is native to the southern part of the U.S. and has wood colored much like mahogany. Bay laurel is a term sometimes applied to the common laurel or cherry laurel. The bay tree of California is a fine species, and rose bay is the name sometimes given to species of the azaleas and rhododendrons. Some trees belonging to this class have berries that yield a fatty oil used in veterinary medicines. The leaves are sometimes used in cookery for the flavor, and in England and some other countries as decorations for Christmas. In ancient times sprigs of the bay tree were worn as a signal of victory.

Baya (*bȧ-yä′*), a kind of weaver bird common in the East Indies. The color is yellow mixed with brown, and the beak is large and conical. Its nests are built in the form of a flask, suspended from a high branch, and the entrance is from below. The male and female birds have separate chambers.

Bayamo (*bä-yä′mō*), a town of Cuba, in the province of Santiago, 60 m. N.W. of the city of Santiago. It is surrounded by an agricultural country. The Spaniards founded it in 1514. At the time of the Spanish occupation it was prominent as a stronghold of insurgents and revolutionists, who sought independence from Spanish rule. Population, *ca.* 5,000.

Bayard (*bī′ärd*), JAMES ASHETON, politician, born in Philadelphia, Pa., July 28, 1767; died in Wilmington, Del., Aug. 6, 1819. He practiced law in Delaware and entered the House of Representatives as a Federalist in 1797. He served in the Senate from 1805 to 1813. His grandson, THOMAS FRANCIS (1828–98), also served in the Senate, from 1869 to 1885. Grover Cleveland chose him as Secretary of State in 1885 and appointed him as American ambassador to Great Britain in 1893. Bayard's appointment marked the first use of such diplomatic rank by the U.S.

Bayard (*bȧ-yär′*), PIERRE DU TERRAIL, CHEVALIER DE, known as "the knight without fear and above reproach," born in Bayard, France, in 1475; died at the Sesia River in Italy, April 30, 1524. He distinguished himself in an expedition under Charles VIII against Naples, and in the decisive successes over the Spaniards and English. Later he gained a victory for Francis I at Marignano, in 1515, and successfully defended Mezieres against the attacks of Charles V. These successes caused him to be called the "Savior of his country." In 1523 he accompanied Adm. Bonnivet to Italy, where he was killed while on guard duty.

Bay City, a city and port of entry in east central Michigan, seat of Bay County, on the Saginaw River, *ca.* 75 m. N.W. of Lansing. Bay City is served by several railroad lines, including the New York Central R.R. and the Chesapeake and Ohio Ry. (freight). It is also a shipping center for the Great Lakes. Its industries are shipbuilding and the manufacture of auto parts, beet sugar, cement, chemicals, machinery, and metal products. The city dominates the Bay City standard metropolitan statistical area (446 sq. m.; pop., 1960, 107,042), which comprises all of Bay County. The area had a value added by manufacture (1958) of $89,694,000; the city had a value added of $68,444,000. It was incorporated in 1865. West Bay City was annexed in 1905. Population, 1950, 52,523; in 1960, 53,604.

Bayeux (*bây-yōō′*), a city in northern France, in Normandy, on the Aure River, 5 m. S.E. of its outlet into the English Channel, in the department of Calvados, *ca.* 20 m. N.W. of Caen. The city is a trading center for farm products. Its manufactures include stained-glass windows and cement pipes. Bayeux is the site of a Roman Catholic cathedral reputed to be the oldest in Normandy; most of the building dates from the

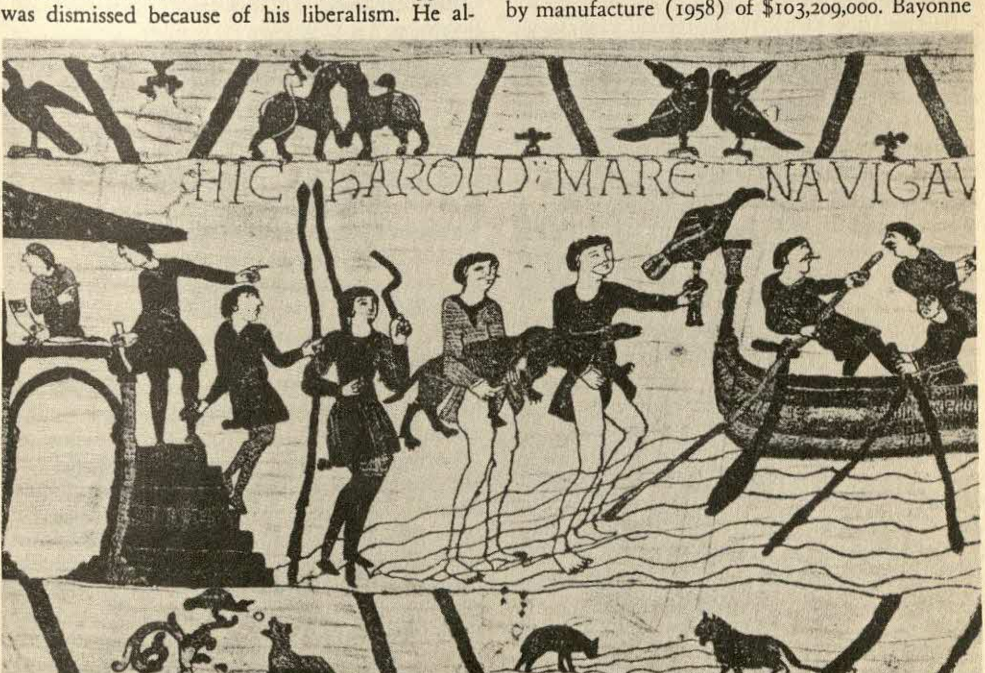
11th through the 13th centuries. Much restoration work and many improvements in the cathedral were introduced by William the Conqueror in 1077. Bayeux was called Augustodurum by the Romans. Population, 1962, 10,641.

Bayeux Tapestry, a linen cloth 20 in. wide and 214 ft. long, on which scenes of the invasion and conquest of England by the Normans were skillfully worked. It is said to be the work of Matilda, the wife of William the Conqueror. The scenes begin with Harold's visit to the Norman court and end with the defeat of the English and the death of Harold at Hastings. It is divided into 72 compartments, and on each one the subject of the scene is indicated in Latin inscription. It was discovered in 1730, and is now kept in the library of Bayeux, France, as a valuable record of scenes and customs in the early period of Norman-French history and the defeat at Hastings.

Bayle (*bĕl*), PIERRE, philosopher, born in Carlat, France, Nov. 18, 1647; died in Rotterdam, Holland, Dec. 28, 1706. The son of a Calvinist minister, he studied at Toulouse, where he embraced the Catholic faith, returning, however, later to Calvinism. He also studied in Geneva and Coppet and was appointed professor of philosophy at the Univs. of Sedan (1675) and Rotterdam (1681). He wrote "Pensées sur la comète, écrites a un docteur de la Sorbonne." In 1693, he was dismissed because of his liberalism. He always fought philosophical as well as religious dogmatism, and his "Commentaire philosophique sur le Compelle Entrare" (1664) pleaded for unconditional tolerance, even toward atheists. His main work, "Dictionnaire historique et critique" (Rotterdam, 1695-97) had a strong influence on the French philosophers of the 18th century.

Bayonet (*bă'ô-nĕt*), a short weapon of steel, constructed something like a dagger, and attached to the end of a musket or rifle. It was so named from the circumstance that the bayonet was first used at Bayonne, France, and it came into general use about the middle of the 17th century. The first bayonets were carried by the soldiers, and when used to repel a cavalry charge, or when making an advance upon the enemy, they were thrust into the muzzle of the gun. Later they were fastened on the outside so as to permit both the use of the bayonet and the gun for firing upon the enemy. Modern firearms made the bayonet lose some of its importance as a weapon.

Bayonne (*bā-ōn'*), a city in northeastern New Jersey, in Hudson County, adjacent to Jersey City. Bayonne is on the Jersey Central Lines and the Pennsylvania R.R. (freight). Oil-refining and the manufacture of cables, chemicals, and food and metal products are the chief industries. The city is a part of the Jersey City standard metropolitan statistical area and had a value added by manufacture (1958) of $103,209,000. Bayonne



HAROLD CROSSES THE SEA

Part of Bayeux Tapestry

has a large U.S. naval base and supply depot, located along part of its several miles of waterfront. The city was incorporated in 1869. Population, 1950, 77,203; in 1960, 74,215.

Bayonne, a port city in southwestern France, on the Bay of Biscay, in the department of Basses-Pyrénées, *ca.* 160 m. W. of Toulouse. Its industries are shipbuilding and sugar-refining. The city's site was known to the Romans as Lapurdum. Population, 1962, 41,149.

Bayreuth (*bī-roit′*), a city in southern Germany, capital of Upper Franconia in Bavaria, *ca.* 41 m. N.E. of Nuremberg. The city's manufactures include chemicals, machinery, pianos, and porcelain. Bayreuth is chiefly known as a cultural and musical center. An annual Richard Wagner festival offers performances of the composer's operas at the Festspielhaus (built 1876), which Wagner himself designed and where some of his works were first produced. Bayreuth was founded in 1194 and became part of Bavaria in 1810. During the 19th century it attracted numerous artists, including Franz Liszt, the poet Jean Paul, and Wagner, all of whom are buried here. Population, 1962, 61,800.

Bay Rum (*bā rŭm*), a fragrant liquid used as a cosmetic and as a liniment for muscle aches. It is made in several ways, one of which is the distillation of rum with bayberry leaves.

Bazaar (*bȧ-zär′*) or BAZAR, originally an Oriental term, now in wider use, referring to a place where goods are exchanged or sold. Usually a bazaar consists of a number of shops, grouped together or in a series along the streets. In the U.S. bazaars are often noncommercial, the proceeds going to a religious organization or charity.

Bazaine (*bä-zān′*), FRANÇOIS ACHILLE, general and senator, born at Versailles, France, Feb. 13, 1811; died in Madrid, Spain, Sept. 23, 1888. He became a soldier in 1831, and served with distinction in Algeria and Morocco, in Spain against the Carlists, and in the Crimea and Italy. When the French invaded Mexico, he was made commander-in-chief of the Imperial Army. In the Franco-Prussian War of 1870-71 he was field marshal, and after the great battles of Mars-la-Tour and Gravelotte, he was besieged at Metz, where he was forced to surrender on Oct. 27, 1870, with an army of 170,000 men. His surrender was generally condemned, and he was tried by court-martial and sentenced to death, which President MacMahon commuted to imprisonment for 20 years. He escaped from Isle Ste. Marguerite, where he was imprisoned, and spent his final years in Spain.

Beach (*bēch*), AMY MARCY CHENEY, composer, born in Henniker, N.H., Sept. 5, 1867; died Dec. 12, 1944. A prolific composer, she wrote many selections for piano and for voice. In 1885, she married Henry H. A. Beach (died 1910). She made several appearances on the concert stage, notably with the Boston Symphony Orchestra.

Her well-known works include "Mass in E Flat" (1892), the cantatas "Rose of Avontown" (1896), "Gaelic Symphony" (1896) for piano and violins, and "Sylvania" (1901).

Beach, REX ELLINGWOOD, author, born in Atwood, Mich., Sept. 1, 1877; died in Sebring, Fla., Dec. 7, 1949. He studied at Rollins Coll. and at law schools in Chicago, Ill., but he soon became interested in writing. A prolific author of vigorous outdoor adventure tales, Beach began his literary career as a short-story writer, frequently contributing to *McClure's Magazine*. He later produced a succession of best-selling novels, many of which were made into motion pictures. Among his best known works are "The Spoilers" (1906), "The Barrier" (1907), and "The Silver Horde" (1909). "Personal Exposures," his autobiography, was published in 1941.

Beacon (*bē′ḳŭn*), a city in southeastern New York, *ca.* 59 m. N. of New York City. It is on the New York Central R.R. Beacon's manufactures include bakery machinery, bricks, paint, paper boxes, and textiles. The city had a value added by manufacture (1958) of $15,939,000. Matteawan State Hospital for insane criminals is located here. Beacon was founded *ca.* 1709 and incorporated in 1913. Population, 1960, 13,922.

Beaconsfield (*bē′ḳŭnz-fēld*), 1ST EARL OF, statesman, better known in history as BENJAMIN DISRAELI, his name as a commoner. He was born in London, England, Dec. 21, 1804; died there, April 19, 1881. He was made an earl in 1876. The son of Isaac Disraeli (*q.v.*), a British author of Jewish faith who embraced the Church of England, Beaconsfield was baptized in his infancy. He received an extensive education, and traveled widely in Europe and the Near East. His earlier interest in a literary career soon shifted to politics, but he continued to write while in Parliament and while holding important posts. "Vivian Grey," published in 1826, was the first of several successful novels. His later writings were of a diversified nature, frequently expressing his political views and interpreting the contemporary scene.

Beaconsfield actually entered the political arena with his election to Parliament as a Tory in 1837. (Previous attempts to gain election without party connection had failed.) During the time he was a member of Parliament (until 1880), he was also Chancellor of the Exchequer (1852, 1858-59, 1860-68) and Prime Minister (1868, 1874-80). Although he held high office only in the latter part of his political career, he made his influence felt from the time he sat in Parliament. As a leading member of the "Young England" group of his party, he joined forces to oust the Peel government (1846), which was accused of surrendering

Tory ideals. It was about this time that Beaconsfield developed his theory of Tory Democracy (similar to present-day "enlightened progressivism"), which influenced British Conservatives for many decades.

In history, Beaconsfield is primarily remembered as the architect of the British empire. In his imperial policy he showed no less aggressiveness than in his conduct of British foreign relations. He was largely responsible for the consolidation of the empire by a proclamation (1876) which bestowed the title of Empress of India upon Queen Victoria. The trust the queen had in her prime minister helped Beaconsfield to carry to success many of his political ideas and proposed laws. A far-sighted statesman, who based much of his political judgment on deep historical knowledge, he bought for England Egypt's share in the Suez Canal, and restrained Russia in her drive toward the Mediterranean Sea. See also *Berlin Treaty*.

Bead (*bēd*), a small globular or cylindrical body, strung with others, worn for ornament or used for decoration. The name is from the Anglo-Saxon word *beade,* or *bede,* signifying a prayer. In the Roman Catholic Church, *beads* commonly refers to the Rosary of the Blessed Virgin. In the early days of the Church, people who could not learn the Psalms by heart, recited 150 short prayers, usually Pater Nosters or Ave Marias, to equal the number of Psalms. According to Catholic tradition, St. Dominic in a vision was ordered by the Blessed Virgin to popularize the recitation of 150 Aves with a Pater between every tenth and eleventh bead of the Rosary which she gave to him. "The beads" nowadays refers to five decades of beads and only rarely to the whole fifteen. In any rosary, the small beads indicate Ave Marias and the large ones Pater Nosters. See also *Rosary*.

Beagle (*bē′gl*), a small hunting dog of which there are various breeds. See also *Dog*.

Beam (*bēm*), in architecture, a piece of timber or other material placed across the walls of a building and which serves to support the rafters. It binds together the parts of the frame as a tie and supports weight. Wood was employed chiefly in architecture as beams until in more recent times iron and steel came into very extensive use, and in some cases beams are now made of cement.

The word *beam* is applied in different ways and has several technical uses. A plow beam is the main piece, either of wood or steel, and to it the colter, plowshare, and moldboard are fixed. The main cross timber in a ship is called a beam, and serves to support the deck and prevent the sides from falling apart. The beams used in large steamboats are of iron, extend across the hull, and are supported near the middle by pillars. In a balance the beam is the part from which the scales are suspended, and the term is applied to a part of a weaver's apparatus, usually a wooden cylinder, on which the web is wound. In electricity, the ray from a flash or searchlight (*q.v.*) is called beam.

EARL OF BEACONSFIELD

Bean (*bēn*), an agricultural product grown for food in early history in Egypt and Palestine, and now largely cultivated in gardens and fields as food for man and beast. It is an annual, from 2 to 12 ft. high. The seeds, usually from 4 to 10, grow in pods about 10 in. long. They are kidney-shaped and measure from one-sixth of an inch to over an inch in length. Beans are nutritious food, containing 23 per cent of nitrogenous matter, similar to casein in cheese, and 36 per cent of starch. There are many varieties, colors, and sizes. The so-called *kidney* bean is grown extensively in the gardens of Canada and the U.S. Other popular species include the *lima* bean, which is quite large and is harvested for cooking before it is ripe, and the *string* bean, a variety with fleshy pods.

Beano (*bēn′ō*). See *Bingo*.

Bear (*bâr*), the name of an animal common to both the warm and cold climates. Numerous species are found in America and Eurasia, but they do not occur in Australia and Africa. They belong to the carnivorous or flesh-eating animals, but show considerable fondness for honey and some kinds of vegetables, and several species live largely on fruits. In cold climates they attain a larger size and greater strength than in the warmer regions, and are much more savage. The body is stout and muscular, with strong legs, a short tail, and long shaggy fur, and the feet are supplied with strong claws well adapted for climbing and digging. They roam in mountain districts and on the seaside, and are skilled as swimmers. The winter season is spent largely in hibernation.

Among the many species is the *grizzly bear* of North America, which is found largely in the region of the Rocky Mts. It is the most ferocious animal of North America and attains a large size, sometimes a length of 9 ft., measuring from the nose to the tail, which is very short. It is colored brown, white, and black, and possesses grizzly or shaggy hair. The *black bear* has its home in all the uninhabited parts of North America. It is much smaller than the grizzly bear, about 5 ft. long, has smooth, glossy, black fur, and lives largely on vegetable food, but in case of hunger will attack and carry off small animals like calves and hogs. It delights to climb trees and rob wild bees of their honey. Its character and habits are similar to those of the *brown bear* of Europe, which is solitary and subsists on animal and vegetable foods. The *cinnamon bear* has a color much like cinnamon and resembles the black bear in its habits. The *polar bear* inhabits the northern portions of America and Eurasia. This species is white and of large size, some being as large as a horse and weighing 1,400 pounds. It hibernates in the winter season, usually in a deep hole dug in the snow or hillside. It lives near the sea or lakes, since it depends upon sea birds, seals, and fish for its principal food. In Southern Asia the *Malayan* bear is found. It is the smallest of the bears and lives exclusively on insects, vegetables, and vegetable fruits.

The bear is a cunning animal, both in obtaining its food and in its habits when trained. In a wild state it often watches other animals from behind shelter, such as a rock or a tree, where it carefully studies their habits, and employs ingenious devices whereby it may make a capture. Under training the bear becomes skilled in many arts of amusement and exhibition. It can be taught to carry a gun like a soldier, to dance to music, to beat a drum, and to perform various capers, and, therefore, is employed to a considerable extent in shows and exhibitions of trained wild animals. The clumsy motions, grave manners, and solemn face make its actions interesting. However, it loses none of its cunning in captivity, and has learned to secure rare bits of food from manager and spectator as compensation for exhibiting its best skill.

The bear is hunted for its fur and flesh. Rugs, robes, and overcoats are made of the fur, which has become very expensive within recent years. The flesh is eaten and the fat is used in making bear's grease. Ornaments are made of the teeth and claws.

Bear and Bull, two terms applied in the stock exchange and at the board of trade. They were first used in London with reference to two parties having contracted, the one to deliver and the other to take stock at a future time at a specified price, and in the intervening time the party to deliver sought to depress the price and the party to receive sought to raise the value. From this circumstance the former came to be called a bear, in allusion to the habit of that animal to pull down with its paws, and the latter a bull, from the custom of that animal to throw up its horns. At present the term is used very generally in America and Europe. Those who wish to lower the price are said to *bear stock,* and those who wish to raise it, *bull stock.*

Bearberry (*bâr′bĕr-rȳ*), a small trailing shrub native to America and Eurasia, and found widely distributed in Canada and the northern part of the U.S. It has evergreen leaves and produces red berries, which are eaten by wild fowl and other wild animals, especially the bear, hence the name. Some species are used in medicine as an astringent tonic.

The term, bearberry, also refers to related species, such as the alpine bearberry, which has black berries, and "Ilex decidua," a species of holly to be found in the southern part of the U.S.

BLACK BEAR AND CUBS

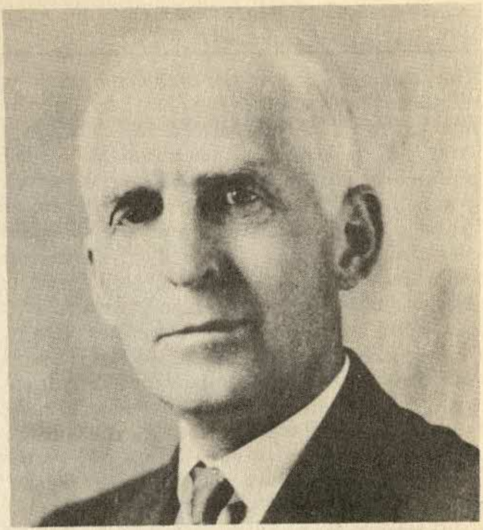
Courtesy U. S. Forest Service

Beard (*bērd*), the hair on the lower part of the face of a man, which appears at the age of puberty. In color it is usually lighter than the hair of the head. Its natural function is presumably to protect the face from cold. Among ancients a long beard was a mark of manliness, and slaves were deprived of beards, though Alexander the Great required his army to shave. The barber's art was first introduced in Rome about 300 B.C. The Normans, at the time of their invasion of England, shaved the entire face and part of the back of the head. Louis XIII of France was not endowed by nature with a beard, and during his time ornamental trimming of the beard and mustache became general in France, and thence spread over the continent. The face was wholly shaven at the beginning of the 18th century, but the practice of wearing beards and mustaches was again inaugurated early in the 19th century.

Beard, CHARLES AUSTIN, and MARY RITTER (*rĭt′tẽr*), American historians. Charles was born in Knightstown, Ind., Nov. 27, 1874; died in New Haven, Conn., Sept. 1, 1948. His wife was born in Indianapolis, Ind., Aug. 5, 1876; died in Phoenix, Ariz., Aug. 14, 1958. Beard received his Ph.D. from Columbia Univ. in 1904 and taught there, with interruptions for research work, until he resigned in 1917 in protest over what he considered President Nicholas Murray Butler's interference with academic freedom. His resignation provoked a national furor. After 1917 he devoted most of his time to writing books and articles, some in collaboration with his wife. Beard first won national attention in 1913 with the publication of his "An Economic Interpretation of the Constitution." This carefully documented book challenged the traditional conception that the Constitution had been written by men solely concerned with the good of the people. Instead, Beard argued, the political ideas of the Founding Fathers were closely correlated with their economic interests, and their economic interests were those of a wealthy class. Beard applied his economic interpretation to other phases of American life in a number of books, most notably "Economic Origins of Jeffersonian Democracy" (1915), and "The Rise of American Civilization" (with Mary Beard, 1927).

Beard was originally known as a belligerent political and social liberal, and his histories were often criticized for being slanted in that direction. He came to be generally recognized, however, as the dean of the political scientists and historians in the U.S.

Mary Beard, in addition to collaborating with her husband, wrote a good deal under her own name. Her special interests were the history of labor and women, and her best-known writings are "A Short History of the American Labor Movement" (1920), "Woman as Force in History" (1946), and the biography of her husband, "The Making of Charles A. Beard" (1955).


CHARLES A. BEARD

As World War II approached, both the Beards became increasingly critical of President Franklin Roosevelt's foreign policy. Charles Beard's "A Foreign Policy for America" (1940) appealed for an "American continentalism" which would avoid "imperialistic" interest in Asia and Europe and center American military and economic concern on the Western Hemisphere. His "American Foreign Policy in the Making" (1946) reflected a similar attitude. This attitude on foreign affairs caused the Beards to be bitterly disavowed by many liberals. In 1944, the Beards published what they announced to be their last collaborative work, a brief, popular survey called "Basic History of the U.S." Charles Beard's last book, published shortly before his death, was "President Roosevelt and the Coming of the War: A Study in Appearances and Reality" (1946). Here Beard broke finally with the liberal tradition, maintaining that Roosevelt was greatly to blame for the catastrophe at Pearl Harbor (*q.v.*) and that he was only too willing to involve the U.S. in World War II in order to divert the nation's attention from the alleged failure of New Deal policies.

Beard, DANIEL CARTER, artist, naturalist, writer, founder of the Boy Scouts in the U.S., born at Cincinnati, O., 1850; died, 1941. After studying at the Art Students' League, New York City, he illustrated books and magazines, taught drawing at the Woman's School of Applied Design (1893-1900), edited the periodical *Recreation* (1905-06). A lover of outdoor life, as well as a student of American Indian and pioneer history, Mr. Beard organized the original American Boy Scout movement (1910), later the Boy Scouts of America, with "Uncle Dan" Beard as its national commissioner. His exemplary contribution to the youth of America won him several honors: the

Gold Eagle Badge; the Roosevelt Gold Medal for Distinguished Service (1927); Mt. Beard, adjoining Mt. McKinley, was named after him; presidency of the Society of Illustrators and of the Camp Fire Club of America. His writings cover the fields of nature, scouting, sports, boats, and pioneering, some of which are: "Boy Pioneers and Sons of Daniel Boone" (1909), "American Boys' Book of Wild Animals" (1921), "Wisdom of the Woods" (1927), and many others.

Beard, WILLIAM HOLBROOK, a painter, born in Painesville, O., Apr. 13, 1825; died Feb. 20, 1900. He studied painting in America and Europe, and in 1857 visited and painted in Italy and Germany. In 1860 he settled in New York. His chief productions include: "Bears on a Bender," "Darwin Expounding His Theories," "Dance of Silenus," and "Bulls and Bears in Wall Street."

Beardshear (*bērd'shēr*), WILLIAM M., educator, born near Dayton, O., Nov. 7, 1850; died Aug. 5, 1902. After attending the rural schools in his district, he took a course in the schools at Dayton, and in 1864 joined the army of the Cumberland. Subsequent to the war he was graduated from Otterbein Univ. and took a post-graduate course at Yale Univ., and in 1881 became president of Western Coll. at Toledo, Ia., 1881-89. In the latter year he was elected superintendent of schools in Des Moines, Ia., and after two years was made president of the Iowa State Coll. at Ames, which position he held until his death. He was president of the Iowa State Teachers' Association and of the National Educational Association. He was active as a lecturer and published a number of addresses and pamphlets relating to education.

Beardsley (*bērdz'lē*), AUBREY VINCENT, artist, a specialist in black-and-white, born in Brighton, England, Aug. 24, 1872; died in Mentone, France, Mar. 16, 1898. A musical prodigy at the age of 12, he worked for some time in an architect's office, then in the office of the Guardian Insurance Co. Later, on the advice of Edward Burne-Jones (*q.v.*), he became an artist and illustrated with drawings such works as Sir Thomas Malory's "Morte d'Arthur" (1893-94), Wilde's "Salome" (1894), and Pope's "The Rape of the Lock" (1896) (*q.v.*). His art was first romantic, later became mainly decorative, following Japanese convention, and finally was influenced by French art of the 18th century. He was often strongly criticized for its unconventionality.

Beardstown (*bērdz'toun*), a city in Cass County, Illinois, 45 m. N.W. of Springfield, on the Illinois River and on the Baltimore & Ohio and the Chicago, Burlington & Quincy R.R.'s. It has large machine shops and manufactures brick, flour, and machinery. The features include the city hall, high school, public library, federal building, and Masonic Temple. It was settled in 1826 and incorporated as a city in 1849. Population, 1940, 6,505.

Bear Flag War, name given to an incident in the events leading to the annexation of California by the U.S. Capt. John C. Frémont, appearing in California late in 1845 with a small detachment, surveying a route from the Mississippi to the Pacific Ocean, alarmed the Mexican authorities who ordered him to depart from the coast region. After a show of resistance, he turned north toward Oregon. Under orders from Washington, he defiantly camped in the Sacramento Valley, where he was joined by American settlers who had heard of forthcoming Mexican reprisals and were bent upon using Frémont's authority as a rallying point. After seizing a herd of horses belonging to the governor, the Americans entered Sonoma on June 14, 1846, captured the presidio, and raised a new flag, with the device of a star and a grizzly bear. Unknown to them, Mexico and the U.S. had begun war on May 13.

Bear, Great and Little, known in astronomy as *Ursa Major* and *Ursa Minor,* two constellations in the northern sky near the north star. Ursa Major contains 138 stars visible to the naked eye. Among them are seven stars—six of the second and one of the fourth magnitude—which form the *Great Dipper.* Ursa Minor contains 24 stars, seven of which constitute the *Little Dipper,* and at its handle is *Polaris,* known from time immemorial as the North Polar Star. The latter was called *Cynosure* by the Greeks, and before the invention of the mariner's compass it was the star

"Whose faithful beams conduct the wandering
ship
Through the wide desert of the pathless deep."

Bearing (*bâr'ing*), in mechanics, that part of a machine upon which another part (shaft, axle of wheel, or pivot) rotates or turns. Often the bearing consists of an adjustable cast-iron block fitted with a cap which secures the bushing in which the shaft runs.

Bear Lake. See *Great Bear Laḳe.*

Bear River, a river of northern Utah and southern Idaho. It rises in Summit County, Utah, in the Uinta Mts., flows north into Idaho, and after a circuitous course of about 400 m. discharges into Bear River Bay, an inlet from Great Salt Lake. It is geologically an interesting stream and passes through a region greatly diversified by mountains and desert tracts of land. The Oregon Short Line Ry. follows the valley through a portion of Wyoming and Idaho. In Bear Lake County, Idaho, it passes through the northern extremity of North Lake, which is considered a part of Bear Lake lying immediately south.

Beatification (*bē-ăt-ĭ-fĭ-ḳā'shŭn*), the official proclamation of the Roman Catholic Church, through the Pope, that a person is to be venerated as blessed. Such a person, who must be deceased, is beatified because of the holiness of his life, the good works he has performed for the Catholic Church or for the sake of Christ, and his moral virtues. The process of beatification represents the first part of canonization (*q.v.*). For canonization, however, the deceased must also have performed at least two miracles. The procedure in both cases is a very complicated one and sometimes stretches through many centuries.

Beatitudes (*bê-ăt'ĭ-tūdz*), the 10 opening paragraphs of the Sermon (*q.v.*) on the Mount (Matthew 5:3-11), containing the ethical concepts of Christianity and outlining the Christian attitude towards the laws of the Old Testament. Matthew 5:17 states: "Think not that I am come to destroy the Law or the Prophets." The difference between the teachings of the Old Testament and those of Christ lies essentially in that the latter is based on a new approach towards the law, emphasizing the spirit rather than the letter of the law.

Beatrice (*bē'à-trĭs*), county seat of Gage County, Nebraska, on the Big Blue River, about 40 m. s. of Lincoln, on the Chicago, Rock Island and Pacific R.R., the Union Pacific R.R., and the Burlington Lines. The Homestead National Monument, site of the first homestead, is located 4 m. from the city. The principal industries are agricultural products, electrical equipment, culverts, pumps, school supplies, windmills, etc. It is noted for its quarries of magnesian limestone, which is used largely for building material. Large quantities of cereals and livestock are shipped to eastern and southern markets. Population, 1900, 7,875; in 1940, 10,883; in 1950, 11,813.

Beatrice Portinari (*bē'à-trĭs pôr-tê-nä'rê*), a woman famous in poetry, born in 1266; died in 1290. She was the daughter of a wealthy family of Florence, Italy, and married Simone dei Bardi. Dante met her when she was nine years old, dressed in a gown of dark red color, and her appearance made a lasting impression upon him. He met her again nine years later, clad in a gown of white, and from that time she was his inspiring muse, though he never saw her again and she died at the age of 24. It is doubtful whether she reciprocated his affection, but his poems afford evidence of the depth of his feeling. He recounts his love for her in the "Vita Nuova," and in the 30th and 31st cantos of "Purgatory" she is made the emblematic personification of divine wisdom.

Beatty (*bē'tў*), DAVID, 1st Earl of the North Sea and of Brooksby, admiral, born in Borodale, Ireland, Jan. 17, 1871; died in 1936. In 1884 he entered the navy, where he took part in the campaigns in Sudan (1896-98) and China (1900) during the Boxer Rebellion. During World War I he commanded the battle cruiser squadron at Helgoland (1914), at Dogger Bank (1915), and at Jutland (1916). From 1919 to 1927 he was 1st Sea Lord of Admiralty.

Beauharnais (*bô-ár-nĕ'*), EUGÈNE DE, soldier and statesman, born in Paris, France, Sept. 3, 1781; died in Munich, Germany, Feb. 21, 1824. He was closely connected with Napoleon Bonaparte; his mother, Josephine, became the wife of the latter. He accompanied Napoleon to Egypt in 1798, where he was severely wounded, and in 1805 became viceroy in Italy. After the defeat of Napoleon at Waterloo he delivered Upper Italy and Lombardy to Austria. Later he was granted the title of Duke of Leuchtenberg by the King of Bavaria, whose daughter he married, and resided at Munich. His sister, Eugénie Hortense, became the Queen of Holland by her marriage with Louis Bonaparte; Napoleon III (Louis Napoleon) was her youngest son.

Beaumarchais (*bô-mȧr-shĕ'*), PIERRE AUGUSTIN CARON DE, celebrated wit and dramatist, born in Paris, France, Jan. 24, 1732; died there May 19, 1799. At first he engaged in literature and published two dramas. Later he became a skilled musician and taught the daughters of Louis XV to play the harp and other instruments. His close connection with the royal house caused his promotion to noble rank and to office. He greatly aided the American revolutionists by supplying them with large quantities of arms and ammunition. Subsequently he supported the French Revolution and was obliged to seek safety by leaving France. His reputation as a dramatist rests largely on his productions entitled: "The Barber of Seville," "The Marriage of Figaro" (adapted for opera by Rossini and Mozart, respectively), and

Courtesy Brown Bros., N. Y.

PIERRE DE BEAUMARCHAIS

"Eugénie." Many of his writings are still widely read and are popular for their wit and satire.

Beaumont (*bō′mŏnt*), county seat of Jefferson County, Texas, on the Neches River. It is situated on gently rolling ground and is served by the Southern Pacific, Missouri Pacific, Kansas City Southern, and Santa Fe R.R.'s. The surrounding country contains productive deposits of petroleum and natural gas. The principal industries are shipping and shipbuilding, oil production and refining, machinery manufacturing, lumber, livestock, and rice. Its rapid growth dates from the discovery of petroleum in 1901. Population, 1900, 9,427; in 1920, 40,422; in 1940, 59,061; in 1960, 119,175.

Beaumont, FRANCIS, a contemporary of Shakespeare, born at Gracedieu, England, in 1584; died in 1616. He was educated at Oxford Univ. and studied law, but soon gave up law for literature. He formed the friendship of John Fletcher (1576-1625, *q.v.*) and collaborated with him. He was one of the most versatile writers of the Elizabethan age. The most noted productions of Beaumont and Fletcher are: "Cupid's Revenge," "The Cockscomb," "The Maid's Tragedy," and "The Faithful Shepherd."

Beaumont, WILLIAM, surgeon, born in Lebanon, Conn., Nov. 21, 1785; died in St. Louis, Mo., April 25, 1853. He read medicine as an apprentice and in 1812 was licensed in Vermont. His fame rests upon his research in the physiology of the stomach. When Alexis St. Martin, a soldier, was wounded in the stomach, Beaumont treated the wound to heal around a 2-in. glazed opening through which he examined some processes of digestion, especially those concerning the behavior of gastric juice.

Beauregard (*bō′rę-gärd*), PETER GUSTAVE TOUTANT, soldier, born near New Orleans, La., May 28, 1818; died there Feb. 20, 1893. The son of an aristocratic family of Canadian-French origin, he was graduated from West Point in 1838, in a class with Gens. Irvin McDowell and William F. Barry. He served as a lieutenant of engineers through the Mexican War, and was made captain and brevet major in 1847. In 1860 he became superintendent of the U.S. Military Acad. with the rank of colonel, resigning to enter the Confederate army as a brigadier general. In April 1861, he commanded at the bombardment of Fort Sumter and gained a victory at Bull Run in July, for which victory he was made general, and a year later he assumed control of the Confederate army in the west. From 1862-64 he conducted the defenses of Charleston, S.C., then reinforced Gen. Lee at Richmond and defeated B.F. Butler at Drury's Bluff. At the close of the war he surrendered to Gen. Sherman, returned to New Orleans, and became president of the New Orleans & Jackson R.R. In 1866 and 1869 he was offered the command of the Rumanian and Egyptian armies, but declined. In 1878 he became president of the Louisiana Lottery Co.

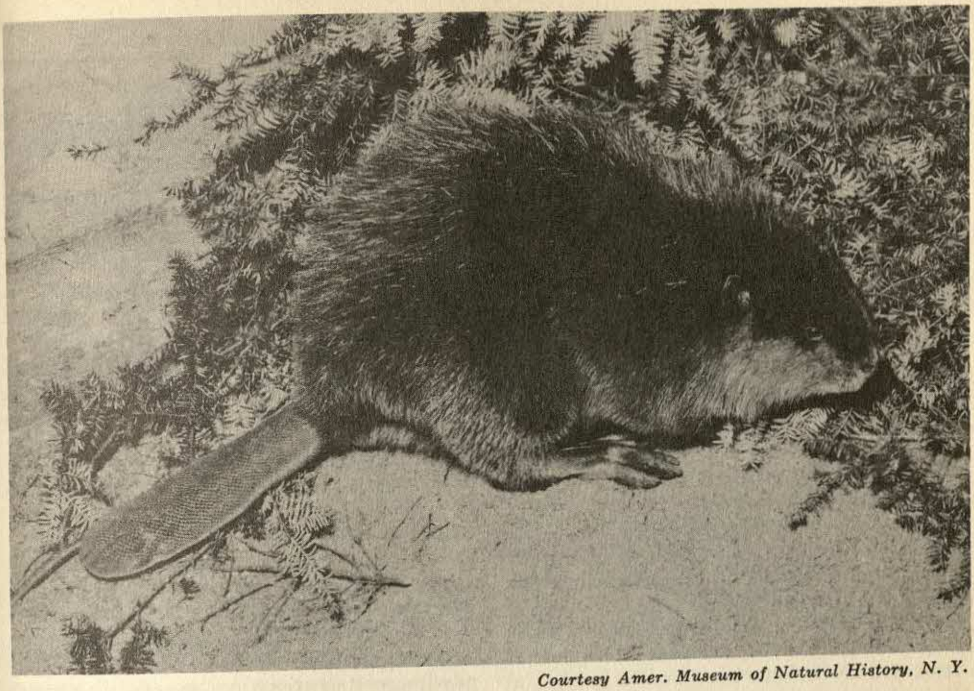
Courtesy Brown Bros., N. Y.

PETER GUSTAVE BEAUREGARD

Beauvais (*bō-vā′*), a city in France, capital of the Department of Oise, on the Thérain River, 49 m. N.W. of Paris; originally founded in 38 B.C. It is situated in a fertile valley and has manufactures of tapestry, carpets, and cotton and woolen goods. The chief buildings are the Gothic cathedral of St. Pierre, and the church of St. Étienne, begun in the 12th century and completed in the 16th. Beauvais is the site of the famous "Manufacture Nationale des Tapisseries," founded in 1664; the Beauvais tapestries flourished especially in the era of Louis XV. Original Beauvais tapestries are still, after the works of the Gobelin manufactory, among the most highly prized. Beauvais was besieged in 1472 by Charles the Bold, Duke of Burgundy, who was repulsed after a heroic defense under the leadership of the heroine Jeanne Laisne. During World War I Beauvais was exposed to heavy air bombardment. Population, 1954, 26,756.

Beaux (*bō*), CECILIA, portraitist and painter, born in Philadelphia, Pa., 1863; died in Gloucester, Mass., in 1942. She studied under William Sartain and in Paris. She excelled in depicting women and children, and among her best-known canvases are "Last Days of Infancy," "Mother and Daughter," and "A New England Woman." She won many prizes and medals, and her work is represented in most of the major galleries in the U.S. as well as in Paris, France, and Florence, Italy.

Beaver (*bē′vēr*), a rodent quadruped valued for its fur. The body is about 2 ft. long, has a flat, scaly tail 10 in. long, and weighs from 30 to 60 pounds. Its color is chestnut or reddish-brown, but sometimes black ones are found, and



Courtesy Amer. Museum of Natural History, N. Y.

BEAVER

some are white. The feet have five toes. The fore feet are designed for work in preparing material for habitations, and the hind feet are webbed for swimming. Beavers are found mostly in the northern parts of North America and Eurasia, but small colonies still exist in Central Europe. They are most numerous in the northwestern parts of North America and Central Russia, but formerly they were common in all parts of these divisions.

Beavers are classed among the semi-aquatic animals that live near lakes, rivers, and other waters where trees and shrubs abound. Their houses are built at the edge of the water, and they dam bodies of water that are sufficiently shallow to freeze solid in the winter, in order to increase the water mass and thus prevent it from freezing to the bottom. These dams are constructed of small trees, stones, and grasses mixed with mud. The mud is put on with the feet and smoothed down by the tail, which resembles a trowel. They are skillful at cutting down trees as thick as one foot in diameter, and usually cut in from the side near the water so as to cause the tree to fall in that direction. Their work is done at night. They subsist on roots, bark, and water plants, of which they lay by a sufficient supply for the winter.

The beaver is valuable for its fur, which has been used for ladies' coats, for dress trimmings, and for men's collars and gloves. In the 17th century beaver fur was used largely in the manufacture of men's hats, from which high hats came to be called *beavers*. Similar hats are now made with silk plush covering. In the early part of the last century fully 200,000 beaver skins were exported annually from America, but the trade has become greatly limited, owing to a general destruction of the beaver in settled districts.

Beaverbrook (*bē′ vĕr-bro͝ok*), WILLIAM MAXWELL AITKEN, 1ST BARON, newspaper publisher and public official, born in Newcastle, N.B., Canada, May 25, 1879. He attended school in his home town. Publisher of the London *Daily Express* and other newspapers, he became wealthy in the Canadian cement industry, then went to England, entering Parliament as a Unionist (1910). He represented the Canadian government at the front during World War I (1916), was raised to the British peerage, and joined the war cabinet as minister of information (1918). World War II found him again in the cabinet as minister successively of aircraft production (1940-41) and of supply (1941-42). In February 1942, he supervised British purchasing agencies in the U.S. and served as Lord Privy Seal in the Churchill Cabinet (1943-45). Among his books are "Canada in Flanders" (2 vols., 1916-17), "Politicians and the War" (2 vols., 1928, 1932), and "Resources of the British Empire" (1934).

Beaver Dam, a city in Dodge County, Wis., about 60 m. N.W. of Milwaukee, on the Chicago, Milwaukee, St. Paul & Pacific R.R. It is situated on Beaver Lake, near the outlet, which furnishes water power. The manufactures include flour, hardware, machinery, hosiery, canneries, electric ranges and refrigerators, and farming utensils. It was settled in 1841 and incorporated in 1856. Population, 1940, 10,356; in 1950, 11,867.

Beaver Falls, a city of Beaver County, Pennsylvania, on the Beaver River, 30 m. N.W. of Pittsburgh, served by the Pittsburgh & Lake Erie and the Pennsylvania R.R.'s. The principal manufactures are steel, cork products, ceramics, dies and foundry products, clothing, paper boxes, chinaware, and motor coaches. Coal, natural gas, oil, limestone, clay, silica sand, and building stone are products found in its immediate area. Geneva Coll. is located here. The site was laid out in 1806, and the city was incorporated in 1868. Population, 1920, 12,802; in 1940, 17,098; in 1950, 17,375.

Bebel (*bă′bẹl*), FERDINAND AUGUST, public man, born in Cologne, Germany, Feb. 22, 1840. He learned the art of a turner and began business as a master turner at Leipzig in 1864, and soon became prominent in labor organizations. In 1868 he was made chairman of a permanent committee appointed by the labor unions to promote legislation. At Eisenach, in 1869, he founded the Social Democratic party, an organization similar to that established by Karl Marx in London. In 1872 he was sentenced to imprisonment on a charge of *lèse-majesté* against the Emperor of Germany. He served in the Reichstag as a Social Democrat almost continuously after 1871, and became prominent as a writer and lecturer in the Socialist movement. His chief publications are: "Woman and Socialism," "The German Civil War," "The Parliamentary Act of the German Reichstag and of the Landtage," and "The Influence of Woman in the Past, Present, and Future." He died Aug. 13, 1913.

Bechuana (*bĕch-ŏŏ-ä′nạ*), a group of Bantu-speaking Negroes living in the interior of South Africa. They occupy the two areas of British Bechuanaland, a former colony later attached (1895) to Cape of Good Hope Province (*q.v.*) and since 1910 a part of the Union of South Africa; and Bechuanaland Protectorate, a British territory of *ca.* 275,000 sq. m. The Kalahari Desert takes up much of the area. Chief occupation of the Bechuana is the raising of cattle, sheep, and goats. The Bechuana have a strong tribal social structure, and each of the eight distinct tribes maintains its own courts, treasury, and hereditary chief. The native chiefs consult with the British resident commissioner on all matters of government.

Becker (*bĕk̤′ẽr*), GEORGE FERDINAND, geologist, born in New York City, Jan. 5, 1847; died Apr. 20, 1919. He studied in his native city and in 1868 graduated from Harvard Univ. Subsequently he took courses at the universities of Heidelberg and Berlin, Germany, and was instructor in mining and meteorology, 1875-79, in the Univ. of California. For a number of years he was associated with the U.S. geological survey, made a trip to South Africa in 1896 to examine the gold and silver mines of that region, and in 1898 went as geologist to the Philippine Islands. Subsequent to the Spanish-American War he returned to the U.S., when he was made director of the Division of Chemical and Physical Research. His study of ore deposits and geological formations led to a better understanding of mineral deposits in the western states.

Becket (*bĕc′k̤ĕt*), THOMAS À, Archbishop of Canterbury and statesman, born in London, England, in 1118; murdered at Canterbury, Dec. 29, 1170. He studied theology at Oxford and Paris, and afterward took courses in law at Bologna and in Burgundy. At the recommendation of Theobald, Henry II made him high chancellor, the duties of which office he discharged vigorously. Afterward he resigned his chancellorship and became a powerful factor in the religious history of England. On account of a disagreement with Henry II, he was slain before the altar of St. Benedict by four barons. He was made a saint by the pope, and Canterbury cathedral was long an objective point for many pilgrims. One of these pilgrimages is described in Chaucer's "Canterbury Tales."

Becquerel (*bĕk̤-rĕl′*), ANTOINE HENRI, physicist, born in Paris, France, Dec. 15, 1852; died in Le Croisic, Aug. 25, 1908. His father was Alexandre Edmond Becquerel (1820-91), also a physicist and the inventor of the phosphoroscope. Antoine entered the École Polytechnique at the age of 20 and subsequently accepted a position with the department of roads and bridges. For many years he was professor of physics at the Museum of Natural History in Paris, where he made many valuable discoveries relating to the solar spectrum. He discovered the Becquerel rays (radiation from uranium) and published many scientific papers, including "Researches on a New Property of Matter" (1896). He was awarded the Rumford Medal of the Royal Society of London. In 1903 he shared with Pierre and Marie Curie the Nobel Prize in physics, in recognition of "the special services rendered by him in the discovery of spontaneous radioactivity."

Bed (*bĕd*), or STRATUM, in geology, a layer of stratified sedimentary rock of similar materials. Formations of this kind are due to the ebb and flow of the tide, and to the movement of silt or material deposited by rivers and the action of waves. The strata differ materially, consisting of several layers or of single sheets or beds. A thin layer is called *lamina* or seam, and where several beds of the same kind of rock are deposited the aggregate is termed a formation.

Bedbug (*bĕd′bŭg*), an insect found in pigeon houses, nests of swallows, and in beds. It hides away in the daytime and comes out to seek its food at night. The body is flat and the head small. The younger insects are almost white, while the adults have a reddish color. Their food consists largely of blood drawn from the body by pricking through the skin and sucking it out. Cockroaches feed on bedbugs.

Bede (*bēd*), or BAEDA, eminent scholar, born in Wearmouth, England, in 673; died May 26, 735. He studied at St. Peter's monastery in his native town, and in 703 was ordained priest by John of Beverley. His writings treat of a variety of subjects, including grammar, music, history, and astronomy. He is regarded the most distinguished scholar of his period in England and came to be surnamed *The Venerable*. The most important of his writings is "Ecclesiastical History of the English Nation," which was translated into Anglo-Saxon by King Alfred.

Bedford (*bĕd'fẽrd*), a town in England, capital of Bedfordshire, 45 m. N.W. of London and situated on the Ouse River. The public buildings include a library, a prison, an insane asylum, and a Gothic church. Ironware is manufactured extensively, especially farming implements, and it has a large trade in lace, corn, and straw hats. Near the town is Elstow, the village where John Bunyan was born, and he wrote his "Pilgrim's Progress" while a prisoner in the town jail of Bedford. Population, about 42,000.

Bedford, county seat of Lawrence County, Indiana, in the southern part of the state, on the Baltimore & Ohio and other railroads. In its vicinity are important deposits of limestone, which is quarried extensively for building purposes. It has railroad shops, roundhouses, machine shops, and other industries. The city has a considerable trade, and is the seat of Bedford Business Coll. It was settled in 1756 and incorporated in 1817. Population, 1900, 6,115; in 1940, 12,514; in 1950, 12,562.

Bedford, SIR FREDERICK GEORGE DENHAM, British statesman. born Dec. 28, 1838. He entered the royal navy in 1852, and was present at the bombardment of Odessa and Sevastopol. In 1855 he took part in the bombardment of Sweaborg, commanded the *Serapis* during the visit of the Prince of Wales in India, and in 1884 organized the flotilla on the Nile. He was made commander in chief at the Cape of Good Hope in 1892 and had charge of the west coast of Africa, and subsequently conducted an expedition against Fodi Silah in Gambia. For four years, beginning in 1899, he was in command of the military station of the West Indies and North America, and in 1903 became governor of Western Australia. He died in 1913.

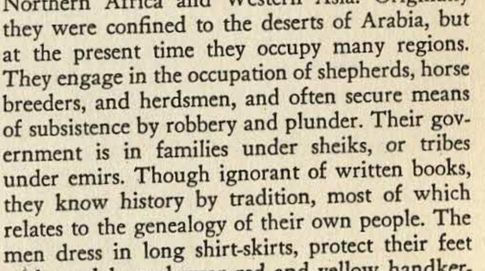
Bedford, JOHN PLANTAGENET, DUKE OF, son of Henry IV, King of England, born in 1389; died at Rouen, France. Sept. 19, 1435. He rose to eminence in the military service. In 1416 he defeated the French fleet and the next year commanded an expedition against Scotland. Later he became regent of France, where he pursued ably and successfully a popular policy. One of the most memorable events of his regency was the execution of the Maid of Orleans, known as Joan of Arc (*q.v.*), which he permitted in 1431.

Bedlam (*bĕd'lạm*) or BETHLEHEM, the first English hospital for the insane, located in Croydon, in suburban London, established in 1814. At the original site in Bishopsgate, London, it was the priory of St. Mary of Bethlehem, but housed mentally ill persons as early as 1402 or 1403. At one time, the hospital was notorious for the brutal treatment of its inmates.

Bedloe's Island (*bĕd'lōz*), an island in New York harbor. Renamed LIBERTY ISLAND in 1956, it is located within the corporate limits of New York City, about 1 m. s.w. of the Battery. The island, acquired by New York in 1758, was ceded to the U.S. in 1800. Fort Wood was erected on the island in 1841. In 1885 it became the site of Bartholdi's Statue of Liberty (*q.v.*), presented to the U.S. by France.

Bedouins (*bĕd'o͞o-ĭnz*), meaning *dwellers in the desert,* a Mohammedan people of the Arab race who lead a wandering life in the deserts of Northern Africa and Western Asia. Originally they were confined to the deserts of Arabia, but at the present time they occupy many regions. They engage in the occupation of shepherds, horse breeders, and herdsmen, and often secure means of subsistence by robbery and plunder. Their government is in families under sheiks, or tribes under emirs. Though ignorant of written books, they know history by tradition, most of which relates to the genealogy of their own people. The men dress in long shirt-skirts, protect their feet with sandals, and wear red and yellow handkerchiefs to cover their heads. They manufacture their own material for clothing, subsist largely from their herds, and eat locusts, rice, honey, and the flesh of small animals. Some tribes are advanced in agriculture and have fixed homes.

Bee (*bē*), the name of any of a large group of insects, of which the honeybee is the most impor-



BEES

A, Drone; B, Queen; C, Worker; D, Leg of Worker; E, Cells for Honey tant representative. In the classification of Linnaeus, all the insects of this group were assigned to the genus *Apis,* but this term is now generally restricted to the honeybee, and the group is classified as two families, the *Apidae* and the *Andrenidae*. In general, it may be said of bees that the head and thorax have feathery hairs, the hind feet are flattened, and the tongue is fitted to lap the nectar of flowers. Probably about 5,000 species are included in the group. The honeybee is considered the most intelligent of the insects. Owing to its industry and the useful product resulting from its labor, it has from remote times attracted general attention and interest. It is probable that more has been written about bees than about any nation of people. At present they abound in almost all parts of the world, except in extremely cold regions.

THE HONEYBEE. The honeybee lives in communities or *swarms* made up of three classes: *queens, workers,* and *males*. The workers are females whose generative organs are imperfectly developed and they rarely produce eggs. In each swarm there is but one true female, called the *queen*. She is impregnated by the male while in the air and never leaves the hive at any other time, except when swarming. A short time after impregnation she begins to lay the eggs, one in each cell, and some days she deposits as many as 2,000. The queen bee is longer than either the males or the workers and can be easily distinguished from the others. The males are called *drones* from the low humming sound which they make in their flight. They do not work and average usually about one drone to every 30 bees. All the work of the society is done by the workers. They gather the honey, make the wax, build the cells, and feed and take care of the young. After the swarming season is over, they kill or expel the drones, as if to economize the food which they lay up for winter.

The eggs are deposited in different cells, some for workers and others for drones and queens. The eggs produce small white larvae in about three days. They are fed with pollen or dust of flowers mixed with water and honey by the workers. After being fed five or six days, they begin to spin a cocoon around themselves. The young bees mature from the cocoon in about 16 days. The queen bee inspects the size of the hive and the number of young queens about to leave the cocoons, and if she finds the swarm small the young queens are killed, but if the society is large one is permitted to come out.

When the young queen appears, the old queen goes from the hive and takes with her a part of the bees, forming a new community. This is called swarming and takes place in the summer season; in the temperate climates this occurs two or three times each season. The new swarm may be easily secured by watching the society in the swarming season, and keeping an empty hive near by, in which the bees will soon begin to make honeycomb and deposit honey. But if no such hive is provided, and in timber districts where communities live in trees, the new swarm moves from place to place until it finds a hollow tree or some suitable place in which to found its home. The old hive is governed by the new queen until another queen appears, when she forms a swarm and seeks a new location. In cases where two queens come out at the same time, as they sometimes do, they fight each other until one of them is killed.

Bees are very active and strong. They make flights to gather food at great distances, which they easily endure without stopping to rest. When they are some distance from the hive, they fly up into the air to observe the direction, and then take the shortest line for the hive. In timber districts, where bees hive in trees, they seek water at the brooks, and their location may be found easily by observing the direction in which they fly after leaving the brook, or the flower where they gathered food. From this habit of bees we have the term *beeline*. The workers and queens each have stings in the back of the body, while the drones are stingless. The sting of a bee is effected by making a wound with a sheath, into which poison is injected and a dart is thrust in to deepen the wound. When the sting is lost, the bee dies. Insects die from the effect of a bee sting, while man and animals have been killed by the attacks of large swarms. The health of bees is remarkable and their diseases are few. The greatest cause of harm is want of good sanitation, too close confinement, dampness, and want of ventilation. In caring for bees it is necessary to provide them with abundant pasture. New swarms should be fed with syrup. An abundant supply of water is essential to good health.

Pollen and the sweet juices of flowers are the food of bees. They go from flower to flower and gather the pollen on the hairs of their legs, while the sweet juices of flowers are taken up by the trunk. The trunk is made up of several divisions so it can be turned easily, bent, shortened, or lengthened to fit the flower cup, which enables them to easily gather the sweets. The front legs and trunk serve to gather juices and pollen from flowers not full blown. The juices are passed from the trunk into a kind of stomach or honey-bag, where they are changed into honey. This stomach serves only for the purpose of making honey, as they possess a second stomach for the digestion of food. The stomach for honey is so constructed that its contents may be utilized at any time for storing in the cells or feeding the young. The workers make the wax by a process of growth on the back part of the body, where a pouch is located filled with wax sticks, from which it is taken by the bees and used in making honeycomb. The honeycomb is constructed of cells, some being used for honey and others for eggs. These cells are in the form of a hexagon, which form serves the best purpose and economizes space.

The cells in which honey is deposited are slightly larger than those intended for hatching, and are constructed nearly horizontally, which admits of easy filling, and the honey is retained in the cells chiefly by capillary attraction. In constructing honeycomb the bees begin at the top of the hive and build downward, placing cells back to back in the process of construction. When the cells are filled with honey they are carefully sealed up with wax to prevent it from escaping. In the construction of honeycomb the entire space is utilized, with here and there small openings to allow the passage to and from the different parts of the hive. Large bee-keepers supply the hive with small frames containing the foundations for honeycomb, which, when filled with honey, are taken from the hive, put in a honey extractor, and the frame with the comb is afterward put back into the hive. In this way the bees are enabled to use one set of combs a number of times, thereby increasing their production of honey. Many bee-keepers feed their bees with syrup, more or less, the entire year, thereby maintaining the swarm and utilizing practically all the honey production. A community includes one queen, some drones, and several thousand workers. The weight of a good swarm is from 6 to 10 pounds.

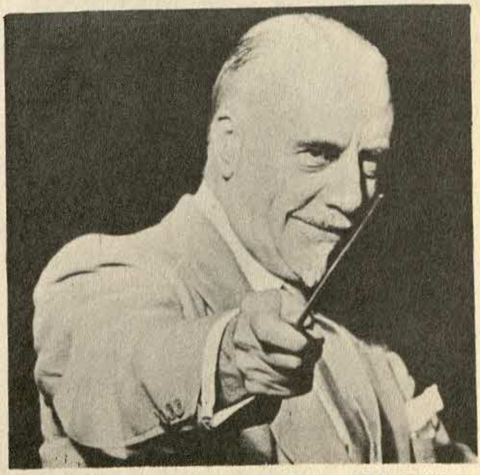
CLASSIFICATION. Bees have been variously classified according to their habits. One recent classification, which has been suggested by W. H. Ashmead of the U.S. Museum, divides them into 14 groups. Of these the first two, the honeybee and the bumblebee, are called social in their habits, because they live in communities. All other bees are solitary in their habits, each one living and working alone. They include some very interesting species, such as the leaf-cutting bee, which cuts off the leaves of plants to line its nest. Another is the carpenter bee, which bores tunnels into the stems of pithy plants, such as the brambles, in which the eggs are laid. The mason bee builds its nest of mud or moistened clay. Bees as a whole are extremely useful in cross-fertilization, since they carry pollen from bloom to bloom.

Beebe (*bē'bē*), (CHARLES) WILLIAM, scientist, born in Brooklyn, N.Y., July 29, 1877; died in Trinidad, W.I., June 4, 1962. He studied at Columbia Univ., and in 1899 he became curator of ornithology of the New York Zoological Society. Beebe organized the collection of living birds in the New York Zoological Park and developed it to comprise more than 3,000 specimens. Also interested in undersea life, Beebe invented the bathysphere, a diving bell capable of withstanding great pressures. In 1934, with Otis Barton, he descended to a depth of 3,028 ft. off the coast of Bermuda. Beebe wrote many books on his adventures and explorations, among them "Jungle Days" (1925), "Beneath Tropic Seas" (1928), "High Jungle" (1949), and "Unseen Life of New York" (1953). See also *Diving*.

WILLIAM BEEBE

Beech (*bēch*), a useful and well-known deciduous tree of America and Eurasia. It grows to a height of about 100 ft. and a diameter of 4 ft., and is a fine ornamental tree, especially when standing alone. The common species include the *white beech, red beech,* and *copper beech.* Large beech forests were abundant in England and Western Europe in ancient times, where herds of swine were fed on the fruit.

Beecham (*bē'chŭm*), SIR THOMAS, conductor, born in St. Helens, Lancashire, England, April 29, 1879; died in London, March 8, 1961. Heir to Beecham's Pills (a patent medicine), he pre-



Courtesy R.C.A. Victor

SIR THOMAS BEECHAM

ferred music to a business career. After graduating from Oxford Univ., he made his debut as a conductor with the Queens Hall Orchestra of London (1905).

He is most distinguished for founding the London Philharmonic Orchestra (1932), and for introducing the compositions of Richard Strauss, Rimsky-Korsakov, etc., to England. He made many foreign tours and in the U.S. appeared with the New York Philharmonic Orchestra and at the Metropolitan Opera House. Less well-known are his efforts as a composer, but his remarkable talents as a concert and opera director gained him world fame.

Beecher (*bē'chẽr*), HENRY WARD, clergyman and orator, born at Litchfield, Conn., June 24, 1813; died in Brooklyn, N.Y., Mar. 8, 1887. He was the son of Dr. Lyman Beecher and for 40 years (1847-87), as minister of Plymouth Church, Brooklyn, N.Y., he ranked as a most eloquent, powerful and magnetic personality. He was educated at the Boston Latin School, Amherst Coll., and Lane Sem. in Cincinnati. In 1837 he began his pastorate at Lawrenceburg, Ind. Two years later he was called to Indianapolis as pastor of a Presbyterian church, and in 1847 entered upon his famous career at Brooklyn. He was popular because of his unequaled boldness, a general humor, power to illustrate, sonorous voice, and skill in undertaking the exposition of social and political evils.

Courtesy Metropolitan Museum of Art, N. Y.

HENRY WARD BEECHER

He delivered a masterful oration, in 1859, on the life and character of Robert Burns. In 1863 he lectured to the people of England, espousing the cause of the Union in the Civil War in America; for his service in influencing public opinion in England, he was invited to deliver an oration on the anniversary of the surrender of Fort Sumter in 1865. A noted trial between him and Tilton resulted in a disagreement of the jury; nine of the twelve decided for Mr. Beecher. He was in great demand as a lecturer and gave lecture courses at Yale and other institutions of learning. In 1882 he declared his disbelief in eternal punishment. Politically he was a Republican, but in the Presidential campaign of 1884 he supported President Cleveland. Among the many productions from his pen are articles published in the Cincinnati *Journal,* the *Farmer and Gardener,* the New York *Independent,* and the *Christian Union.* His best-known publications include: "Lectures to Young Men," "Norwood, or Village Life in New England," "Lecture-room Talks," and "The Life of Jesus the Christ." His "Autobiographical Reminiscences," edited by Ellinwood, 1898, give an interesting survey of his life and activities.

Beecher, LYMAN, clergyman and theologian, born at New Haven, Conn., Oct. 12, 1775; died in Brooklyn, N.Y., Jan. 10, 1863. He was a descendant of New England ancestors, who settled in New Haven in 1638, and father of Henry Ward Beecher and Harriet Beecher Stowe. His mother died while he was an infant, and he was adopted by Lot Benton, an uncle. In 1797 he graduated from Yale, and began his clerical career in the Presbyterian Church at East Hampton, Long Island, where he remained 11 years. He next accepted a call to Litchfield, Conn., where he was a minister for 16 years, gaining renown for his denunciations of intemperance. He also helped to found the American Bible Society. In 1826 he was called to Hanover Church, Boston, and during the great controversy between Dr. Channing and Congregationalism he warmly upheld the Puritan doctrine. After six years he became the president of the Lane Theological School near Cincinnati, and in 1842 returned to Boston to revise his books. His best-known works are: "Remedy for Duelling," "Views on Theology," and "Sermons on Temperance." He spent the last years of his life at the home of Henry Ward Beecher, in Brooklyn.

Bee-Eater (*bē'ēt-ẽr*), the name applied to several birds related to the kingfisher. They have long wings and a greenish color, resemble swallows in flight, and prey upon wasps, bees, and other insects. Their nests are built in holes, which they construct in river banks or on the seaside. In many places, especially on the Volga and Don, they have honeycombed the banks by excavations. In some countries they are a pest on account of their destruction of bees, which they catch on the wing.

Beef (*bēf*), the flesh of the ox or cow, used either fresh or salted. It is the most nutritious of all meats, and is well adapted to the most delicate constitutions. A beefsteak is known by the part of the animal from which it is taken, as rib, sirloin, or round. Porterhouse, sirloin, and prime are considered the best cuts. The best quality comes from well-fed animals. The cut edge of good beef is bright red in color, and should be of a uniform tint, except where marked by fat and connective tissues. It loses 20 per cent of its weight in roasting and 30 per cent in boiling. In the raw state it contains 50 per cent of water. It possesses the greatest amount of nutrition when fresh, but is preserved by canning, salting, drying, and many other ways with good results. Beef-producing and beef-packing are two highly important industries in the U.S. and Canada.

Beefeater (*bēf'ĕt-ẽr*), a bird of the starling family, native to South Africa. It associates with the buffalo, camel, and cattle, and feeds upon ticks on animals. Birds of this class are sometimes called *ox-peckers*. The name "beefeaters" has been applied for many years to the yeomen of the royal guard in Great Britain. Their costume is in the fashion of the time of Henry VII; also, wardens of the Tower of London who wear similarly picturesque uniforms.

Beef Extract consists of the extractives of muscle substance and water. The nitrogenous extractives are creatine, hypoxanthine, xanthine, guanine, and carnine. Non-nitrogenous extractives are inosite, glycogen, sugar and lactic acid; mineral salts; potassium carbonate, sodium chloride, and still smaller amounts of magnesium, calcium, and iron oxide. Pharmaceutically, extract of beef, *extractum carnis,* "is a residue obtained by extracting fresh, sound, lean beef by cooking with water, adding salt, and evaporating the broth at a low temperature, usually in vacuum, until a thick, pasty residue is obtained" (*National Formulary*). Physiologically, the nutritive value of meat extracts is negligible, but some of the extractives therein have a stimulating effect upon the flow of gastric juice.

Beelzebub (*bē̇-ĕl'zē̇-bŭb*), personification of the devil, also called "the prince of evil," the symbol of everything sinful. It is claimed that the word is derived from Baal Tebub, the god of the Philistines, mentioned in the Old Testament.

Beer (*bēr*), a beverage prepared by means of a process of fermentation from malt, hops, and water. The malt for general manufacture is made of barley, or any starchy grain. The different kinds of beer are usually classed as lager, ale, porter, and stout.

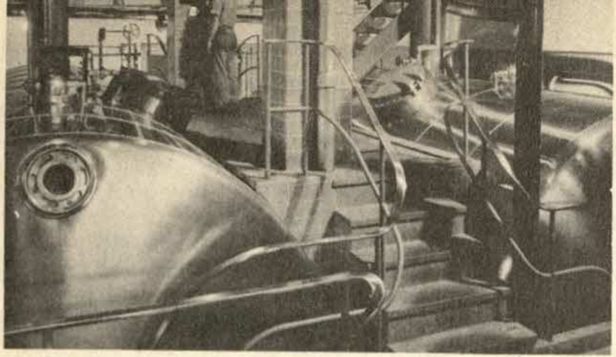
From history we learn that beer was a well-known beverage among the Egyptians 3,000 years B.C., and was extensively manufactured by the early nations. Larger quantities of it are consumed than of any other beverage. Germany, Great Britain, and the U.S. are the leading nations in the consumption of beer. The 18th or Prohibition Amendment to the U.S. Constitution (effective 1920) outlawed manufacture and sale of beer in this country, but with the repeal of prohibition (1933), the industry was revived. Consumption of beer in the U.S. averages 50,000,000 barrels annually, but in some years over 65,000,000 barrels were consumed.

All photos in this series courtesy Walter Engel, N. Y.

BREWING PROCESS OF LAGER BEER
TUBE END OF A PNEUMATIC CONVEYOR

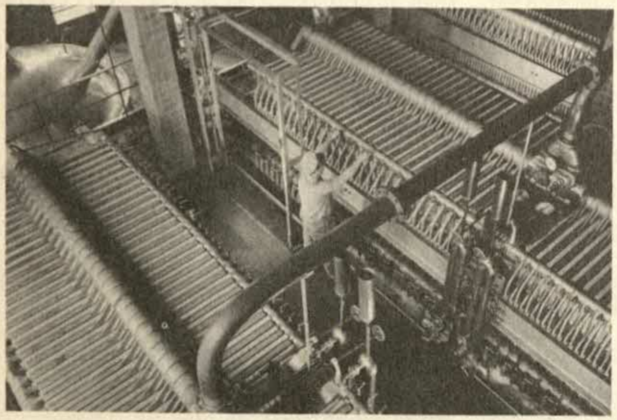
A pneumatic conveyor lifts the barley used in making lager beer from the barges or other conveyances bringing it to the plant to an expansion chamber

The process of making beer is called *malting*. The first step in the process is to place the barley or cereal in an iron cistern, where it is soaked or steeped from 70 to 95 hours, when the water is drawn off and the barley placed on the floor of a



MASH TUN

From the expansion chamber the grain drops into storage bins and then moves by elevator to barley malt mills where it is moistened so that the grain sprouts. The moisture is then entirely removed and the barley malt is conveyed from the mills through a scale hopper, which automatically weighs the grain insuring the correct amount in each brew, to a fore masher where hot water is added to form a mash. From the fore masher, the mixture drops to a mash tun where it is stirred by an agitator at controlled temperatures

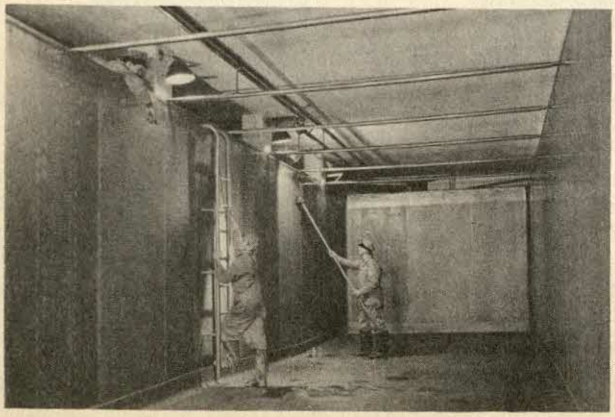


SIXTY-CHAMBER FILTER PRESS

While in the mash tuns, the starch in the mash is dissolved and converted to maltose, forming a mixture called wort. In filter presses, husks and undissolved grain are separated from the wort. The spent grain is used for cattle feed

BREW KETTLE

From the filters, the clear wort flows to large brew kettles where it is boiled, concentrated, and flavored with hops. It is then strained through a hop strainer, which removes the spent hops, and is passed along to a collecting tank



STARTING TANK, INTERIOR VIEW

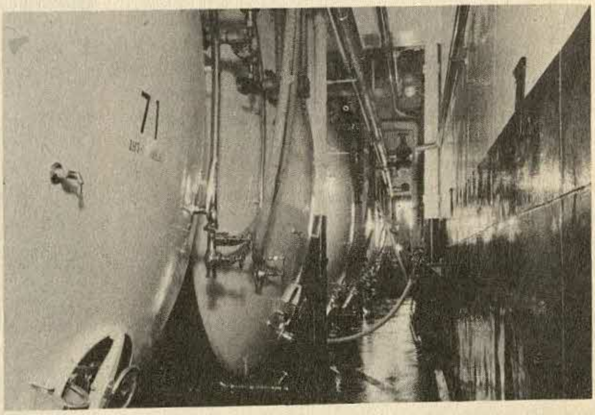
The wort passes to the starting tank after first going through a tube cooler and after the addition of yeast. The mixture is kept in the starting tanks just long enough for the fermentation process to begin

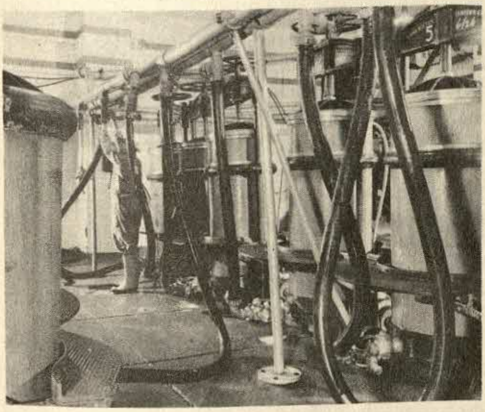
CEMENT FERMENTERS

The mixture of wort and yeast, now called beer, passes into fermenters to be converted to alcohol and carbon dioxide

STORAGE TANKS

The fermentation process takes about seven days, after which the beer is cooled and stored in tanks. The sparkle and foam of beer are added here by the slow fermentation of the Krausen, or young unfermented beer, and the liquid is clarified and mellowed





YEAST REMOVING FILTERS

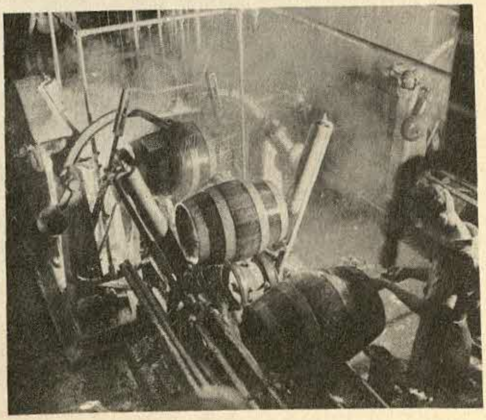
The beer is then run from the storage tanks through filters which remove the remaining yeast. In the filters, the beer receives a final polish before bottling and racking

WASHING, FILLING, AND CAPPING

From the washing, filling, and capping operations, the bottles progress to pasteurizers and labeling machines

CLEANING BEER KEGS

These kegs are being cleaned en route to the filling arms in the racking room, where they are filled with the finished beer and plugged



dark room, where it swells and sprouts as if planted in the ground. When the little sprouts have grown about half an inch long, the largest possible quantity of sugar has been formed. The malt is then taken to a drying kiln, where it is dried for a period depending upon the kind of beer to be made. In making light-colored ales the malt is dried only a short time, while in darker-colored ales a longer time is allowed; this depends entirely on the strength and color desired. *Brewing* now begins with the removal of soluble products from the malt. After the malt is dried, it is crushed and mixed with hot water in a mash tub. Here another change takes place, by which the starch is converted into fermentable sugars termed *maltose* and unfermentable sugars called *dextrose* or *malt dextrose*. After a few hours the liquid, now called *sweet wort,* is drawn off and boiled with hops in a copper kettle. It is next strained and cooled and put into a fermenting tun; a little yeast is added, which causes the liquid to froth and bubble up, indicating that the action of the yeast is converting the sugar into carbonic acid and alcohol. A top-fermenting yeast, one which rises to the top, is used in making ale, porter, and stout; a bottom-fermenting yeast, one which settles to the bottom, is used in making lager beer, however.

American beers contain an average of 3.6 per cent alcohol by weight. Ales run slightly higher, and special products may be as high as 6.5 per cent by weight, 8.0 per cent by volume. With the completion of the process, the liquid is generally stored in tanks prior to bottling.

While stored, fermentation goes on slowly for some time. The beer remaining in this state for a long time is called *lager beer,* meaning, in German, stored beer; the beer used immediately after fermentation is called *schenk beer*. The process differs somewhat in various breweries, but the general method is practically the same. The largest breweries in the U.S. are located in St. Louis, Chicago, Milwaukee, Philadelphia, Baltimore, and New York. Montreal and Toronto are leading brewing centers of Canada.

Beerbohm (*bēr′bōm*), SIR MAX, critic, essayist, and caricaturist, born in London, England, Aug. 24, 1872; died in Rapallo, Italy, May 20, 1956. Half-brother of Sir Herbert Beerbohm Tree (*q.v.*), he was educated at Oxford Univ. and succeeded G. B. Shaw as critic on the *Saturday Review* (1898). His varied writings and drawings delighted sophisticated Londoners. Books of his caricatures satirizing English society and politics include "Twenty-five Gentlemen" (1896), "The Poet's Corner" (1904), and "Observations" (1925); his essays include "The Happy Hypocrite" (1897), "More" (1899), and "Variety of Things" (1928). His parodies on authors, "A Christmas Garland," appeared in 1912, and his one novel, "Zuleika Dobson," in 1911. Beerbohm, who lived in Rapallo after 1910, was knighted in 1939.

Courtesy Brown Bros., N. Y.

MAX BEERBOHM

Beernaert (*bār′närt*), AUGUSTE MARIE FRANÇOIS, statesman, born in Ostend, Belgium, July 26, 1829; died in Lucerne, Switzerland, Oct. 6, 1912. A lawyer by profession, Beernaert became a member of the Belgian chamber of deputies and served also as minister of public works (1873-78). He was made minister of agriculture and industry (1884), president of the council and minister of finance (1884-94) and president of the chamber of deputies (1895). Beernaert's activities in the interest of peace began in 1889 when he was a delegate to the Hague Peace Conference. Appointed to the permanent court of arbitration at The Hague, he gained prominence for his untiring efforts to maintain world peace. In 1909 he, together with Baron d'Estournelles de Constant, was awarded the Nobel Peace Prize.

Beers (*bērz*), CLIFFORD WHITTINGHAM, founder of the mental hygiene movement, born in New Haven, Conn., March 30, 1876; died in Providence, R.I., July 9, 1943. He was graduated from Sheffield Scientific School, Yale Univ., in 1897. After his confinement in mental institutions for three years, he became interested in improving the treatment of mental patients and in the prevention of mental illness; and in 1908 he founded the Connecticut Society for Mental Hygiene, the first organization of its kind. He also organized the National Committee for Mental Hygiene (1909), the American Foundation for Mental

Hygiene (1928), and the International Foundation for Mental Hygiene (1931). In 1933 he received a gold medal from the National Inst. of Social Sciences for distinguished service. In addition to his autobiography, "A Mind That Found Itself" (1908), in which he described his experiences as a mental patient, he was the author of many articles on mental hygiene.

Beersheba (*bē-ẽr-shē'bạ*), a town in Biblical history. It was located on the approximate site of the modern Bir-es-Seba, Israel, a town about 50 m. s.w. of Jerusalem, on the edge of the Negev desert. The name of Beersheba, interpreted as meaning "seven wells," or, alternatively, "well of the oath," is identified in the Bible with wells located in the ancient valley of Gerar and claimed first by Abraham (Genesis 21:25-33) and then by Isaac (Genesis 26:15-33). The place is mentioned repeatedly in the Bible and was sometimes used as a way of referring to the southern limit of ancient Palestine ("from Dan to Beersheba"). During the Roman occupation, a flourishing community existed on the site of Beersheba, and in more recent times an Arab trading center was located here. Under the Israeli government the present town of Bir-es-Seba is being strongly developed into an industrial community to handle resources extracted from the Negev and the Dead Sea. Population, 1944, 5,570; 1954, 16,300; 1958 (est.), 40,000.

Beers (*bārs*), JAN VAN, poet, born in Antwerp, the Netherlands, Feb. 22, 1821; died there, Nov. 14, 1888. He is credited with introducing an element of realism into Flemish poetry, although his work, including "Dreams of Youth" (1853), "Illusions of Life" (1859), and "Sentiment and Life" (1869), is still noticeably idealized. His simple appealing picture of folk life in Flanders, presented in such poems as "Begga" (1888), made him popular in his day both in the Netherlands and Flanders.

Beeswax (*bēz'wăk̦s*), the fatty substance secreted by bees and used by them in constructing the honeycomb. It is not collected from plants but is a secretion elaborated within the body of the animal from saccharine matter or honey and extruded in scales from beneath the rings of the abdomen. Beeswax has commercial value in modeling, for candles, and for other purposes. Before being put on the market, it is purified and bleached or whitened.

Beet (*bēt*), a biennial plant (*Beta vulgaris*) of several varieties, in the goosefoot family, cultivated principally for food and as a source of sugar (*q.v.*).

The common red garden beet is planted from seed, and the fleshy taproots are harvested several weeks after sowing. When grown for seed, a second year of growth is required for the production of flowers. Beets are eaten fresh, canned, or pickled; and the young leaves are also eaten as a green vegetable. Historically, only the leaves of the beet plant were eaten in pre-Christian times; the taproots were not used as food until after the 16th century.

The sugar beet is a variety of the red beet raised for the production of sucrose, or table sugar. The earliest studies on the utilization of the beet as a sugar source were made by the German chemist Andreas S. Marggraf, about 1745. In the early 19th century, Napoleon encouraged the growing of sugar beets, but he was ridiculed for his efforts. His ban on English imports, including sugar cane, however, gave added impetus to the establishment of the sugar-beet industry. The growing of sugar beets in the U.S. began about 1875. At present, about one-third of the world's sugar, or more than 11,000,000 tons, is derived from the sugar beet annually. European countries, Asia Minor, North China, Japan, and the U.S. are the chief producers.

California leads among U.S. states in the production of beet sugar. The annual sugar-beet production in the U.S. increased from 7,000,000 tons in 1928 to over 13,000,000 tons in recent years, although the acreage harvested has remained about the same, fluctuating between 600,000 and 900,000 acres. The annual production has a farm value of *ca.* $150,000,000.

Other varieties of beet include the mangelwurzel, grown in Europe chiefly for stock feed, and swiss chard, grown for its leaves, which are eaten like spinach. Some leafy varieties of the beet have highly colored leaves and are cultivated as ornamentals.

Beethoven (*bā'tō-vẹn*), LUDWIG VAN, composer, born in Bonn, Germany, Dec. 16, 1770; died in Vienna, Austria, March 26, 1827. Beethoven, the master of instrumental music, came from a family of Dutch origin which had migrated into Germany and had produced many musicians but no other creative artist. Ludwig's father, Johann van Beethoven, an undistinguished singer in the electoral chapel at Bonn, was musician enough to recognize the unusual ability of his son. At five the child was already taking piano and violin lessons from his father. At eight he was introduced as a child prodigy, playing the piano in a public performance at Cologne. At 13, his first original piano sonatas were published. At 17, during a visit to Vienna—where Gluck, Haydn, and Mozart insured the city's greatness as a musical center—the boy's improvisations drew from Mozart the prophetic comment that the young musician was worth watching, that he would one day "make a stir in the world."

Limited by his finances, Beethoven's father was unable to provide good teachers for his son, but that situation was soon remedied. The boy's ability was so outstanding that the Elector of Cologne

Courtesy Brown Bros., N. Y.

LUDWIG VAN BEETHOVEN

became interested, assumed responsibility for his training, and made him a pupil of the excellent organist Christian Gottlob Neefe (1748-98). Under Neefe he made the acquaintance of Johann Sebastian Bach's "Well-Tempered Clavier," considered at that time the most fundamental and important composition for the piano, and at 14 he was appointed Neefe's assistant as court organist. The next important development in Beethoven's career turned upon his meeting with Count Ferdinand Waldstein, who became the young man's patron and arranged his visit to Vienna in 1787. Called back to Bonn by his mother's illness, Beethoven was unable to return to Vienna until 1792—but this time it was to make the city his permanent home.

As Count Waldstein's protégé, young Beethoven soon found favor with the music-loving aristocracy of Vienna, who appreciated both his brilliant instrumental performances and his genius as a composer. The fact that his patron, the Elector of Cologne, was an uncle of Leopold II, Emperor of Austria, helped to open all doors, and made it possible for him to study with Haydn (*q.v.*), the famous composer. His relationship with Haydn proved unfortunate, however, and Beethoven made secret arrangements to study counterpoint with Johann Schenk (1761-1836), while continuing his lessons with Haydn. He also took lessons later from Georg Albrechtsberger (1736-1809) and Antonio Salieri (1750-1825). Meanwhile, his reputation was steadily growing, especially among musicians and serious lovers of music.

The year 1795 marked the beginning of Beethoven's public career. In March he appeared as composer and virtuoso in a concert given by Haydn, and in October several of his compositions were published—Opus I, consisting of three trios for piano, violin, and 'cello. In 1796 he traveled to Prague, later to Dresden, Leipzig, and Berlin. In the Prussian capital his playing so impressed Frederick William II that he offered the young musician many inducements if he would settle in Berlin. Despite fame at home and triumphs abroad, it was not until 1800 that Beethoven first gave a concert of his own compositions, presenting his "First Symphony" (Opus 21, 1800) and the "Septet" (Opus 20). Although from this time on the composer's fame spread rapidly throughout the world of music, it was 1813 before a concert, given on Dec. 8 of that year, brought him acclaim from the public.

Never very robust, Beethoven frequently sacrificed considerations of health to absorption in his work, and the last ten years of his life were afflicted with various forms of illness in addition to the deafness which had gradually increased since it began in 1800, finally becoming complete in 1819. This disaster, which would seem the ultimate tragedy in the life of a composer, had no adverse effect upon the master's creative ability. Personal unhappiness—resulting from unfortunate experiences in love, and disappointment over a nephew to whom he had given a father's love and care—seemed only to deepen and enrich his genius. He continued until the very end of his life to compose with magnificent power and passionate concentration.

Beethoven's compositions show an extraordinarily wide range through the field of instrumental music, from piano solos to the most monumental orchestral works. He endowed the previously limited sonata form with infinite variety, producing masterpieces such as the *"Pathétique"* (1799); the "Moonlight" and *"Kreutzer"* (1802); the *"Appassionata"* and "Waldstein" (1804). Among his nine great symphonies the best known are the "Third" (*"Eroica,"* 1804); the "Fifth" (1805); the "Sixth" (*"Pastoral,"* 1804); the "Ninth" (*"Choral,"* 1823). He wrote only one opera (*"Fidelio,"* 1814), and one great oratorio (*"Missa Solemnis,"* 1822), but his works include several operatic overtures such as the three "Lenores," "Egmont," "Coriolanus," and others. Equally wide in range, and no less important, are Beethoven's piano concertos (notably, the famous "Emperor Concerto"), his great number of lovely songs and chamber compositions, and his one violin concerto (1806). There are in all 138 numbered compositions, in addition to many others without opus numbers.

The developing genius of Beethoven falls into three distinct phases, cumulative in richness and power. The first period (opus numbers 1 to 50, 1795-1803) is marked by adherence to the established traditions of his predecessors, though never in the sense of being an imitator. The second (opus numbers 53 to 100, 1803-15) is characterized by the passionate, powerful "Third Symphony" (*"Eroica"*) with which it opened. The third and last phase (opus numbers from 100 on, 1815-27) reveals the titanic force of the master's creative genius at its height—the towering architectonic outline of his musical structure combined with absolute perfection in every smallest detail of composition. Beethoven's supreme importance to musical history is rooted in his will for free expression, and in the tremendous intensity of his emotion. These two primary trends—always brought within the confines of a structural form—emerged gradually from the traditions of a Mozart and a Haydn into a more independent style, and led eventually into the climactic phase of more and more abstract forms where he changed the tonal values of music so completely that they actually and literally introduced a new epoch in its development.

Beethoven's tremendous significance to all the music written after him during the 19th and 20th centuries is not, however, confined to that last great period. In and through the whole body of his creative works he originated that mingling of classical and romantic styles which was to become so characteristic of the works of 19th-century masters. In other words, Beethoven fused the classical forms of his day with superb expression of his own entirely subjective and individual emotional moods to which the great Richard Wagner (*q.v.*), years later, paid poignant tribute in several remarkable essays.

Beetle (*bē′t′l*), an order of insects called by naturalists *Coleoptera,* which means sheathed wings. They possess four wings, an inferior pair, which are the real wings used in flying, and a superior pair that form a protection for the others. In walking they appear to have no wings, so nicely are the real wings covered and protected. The real wings are membranous, while the wing covers are horny, often beautified by green, yellow, blue, and diversified colors. There are no less than 150,000 species showing slight differences in color, size, form, or habits, of which fully 11,000 are native to the region of North America lying north of Mexico. They undergo three full stages in life. At first they are *grubs* or *larvae,* in which form they have three pairs of legs, horny heads, and wormlike bodies; those hatched in fruit and nuts have no legs. The second stage is entered after a case or cocoon has been prepared, though a cocoon is not always provided. This is called the *pupa state,* in which many varieties lie for years before developing into beetles. Most species live on land, though there are a large number that live in water. Land beetles live under rocks, logs, or leaves, among stones, and in holes drilled in wood.

Various beetles have been named from their size, form, and habits of life. The *carrion beetles* are those that feed upon dead animals. *Scavenger beetles* live on filth and refuse matter, and are provided with feet fitted to dig holes in the ground. *Sexton beetles* have a strong sense of smell so they can easily find the dead bodies of small animals, such as frogs, snakes, and mice. These they take to a place where the ground is soft and bury them safely under cover. In these remains they deposit their eggs, and when the young are hatched they feed upon the food provided in this way. The *ambrosia beetle,* of which there are several species, bores in oak and other wood, often doing great damage. A species of beetles extensively known as *tumble bugs* belongs to this class. In ancient Egypt they were called *sacred beetles* and were worshiped, for the reason that they are useful in clearing up manure and burying it below the surface. This they do by making round balls, in which they lay their eggs, and then bury them deep in the ground. *Tiger beetles* have stripes and are fierce in combat with other insects. They prey upon other beetles, flies, and caterpillars, and possess cannibalistic tendencies among themselves. The *bombardier beetles* possess a strong liquid, which they shoot at their enemies. Similar beetles include the *spring beetles, horned bugs,* and *curculios.* The last mentioned live in orchards and feed upon fruits and grains. The worms often found in plums, nuts, apples, and various other fruits are hatched from eggs laid by beetles. A species of beetle known as *Spanish fly* is used in making powder and blistering plasters. Other well-known beetles are the *potato bug, squash bug, oil beetle, lady-bird, glowworm, blister beetle, Japanese beetle,* and *firefly.* See also picture on next page; and color plate, *Beetles of North and South America,* Volume II.

Courtesy N. Y. Zoological Society

STAG BEETLE

Courtesy U. S. Dep't of Agriculture

JAPANESE BEETLES FEEDING ON CORN

Beets (*bāts*), NIKOLAAS, poet and author, born at Haarlem, Holland, Sept. 13, 1814; died in 1905. He studied at Leyden and entered the Protestant ministry, and in 1875 became professor of theology in the Univ. of Utrecht. His "Camera Obscura," published under the pseudonym of *Hildebrand,* is one of the finest productions of the last century in the Dutch literature. Other works include: "Poems," and "Ada of Holland."

Beggar (*bĕg′gẽr*), one who implores people for alms. In 1572 a law of England provided a severe penalty for all able-bodied persons convicted of the offense. Laws prohibiting vagrancy are on the statute books of many countries.

Beggar's Opera, THE, opera with libretto by the poet John Gay (1685-1732) and score by Dr. John Christopher Pepusch (1667-1712), first produced in London, England, 1728. This satire on contemporary society forced the over-flamboyant Italian opera of that day from the boards, opening the way for the typically Victorian comic operas of Gilbert and Sullivan a century later. "The Beggar's Opera" has often been revived in modern times. A new version, "Die Dreigroschenoper," was offered (1928), by Kurt Weill.

Begonia (*bē-gō′nĭ-ȧ*), the name of a large family of plants, of which several species are cultivated in flowerpots and greenhouses. The plants are perennial and include both herbs and shrubs. Among the popular species grown in gardens as flowering plants are those known as *Begonia, Beefsteak Geranium,* and *Glory of Lorraine*. The flowers are largely pink or red. Young plants are raised from the seed, or they may be obtained by dividing the bulbous roots and by cutting and placing the stems in the soil. Many varieties of fine flowers have been propagated from the tuber-root kind.

Behar and Orissa (*bẹ-här′ and ō-rĭs′ȧ*), a British Indian province bounded by Nepal, Bengal, the Madras presidency, the Bay of Bengal, and the Central and United Provinces. The region is varied as to geology, climate, and racial groups; Hindus form 80 per cent of the population. Rice, wheat, sugar and tobacco are grown. Coal and iron ore deposits are large. Behar came under the East India Co. in 1765. Patna is the capital. Area, 120,000 sq. m. Population in 1941, 48,000,000.

Behaviorism (*bē-hāv′yẽr-ĭzm*), in philosophy, a system which was developed and won most of its followers in the U.S. Its originator, J. B. Watson (1878-1958), conceived of it not as a philosophy, but as a psychology closely related to human physiology. Rejecting consciousness, sensation, perception, imagery, and will, he confined himself to an exclusively objective study of man's behavior. He explained the reactions of man as responses of a somewhat mechanical nature to various stimuli. Environment, natural or artificially produced, generates a series of conditioned and "learned" responses which become habits. This theory was to a certain extent based on the experiments of Pavlov and other Russian physiologists, who discovered that the reflexes of dogs and other animals could be varied by conditions. Watson, however, goes further and interprets even thinking and emotion as behavior, or conditioned reflexes. Logically, the existence of instincts and also the influence of hereditary patterns of behavior are denied. Watson considered behavior the cumulative result of mechanical responses to various stimuli, and it was his theory that, within reasonable limits, laws could be evolved to predict man's behavior. As a further step, it might be possible to control man's behavior by regulating the stimuli to which he is subjected. Watson's views are expressed in "Psychology as the Behaviorist Views It" (1913), and "Behaviorism—an Introduction to Comparative Psychology" (1914).

In reality, this psychological theory is not new in itself. It represents a revival of certain medieval theories which considered the reactions of the body to be automatic. The difference between this theory and the medieval Catholic theories lies in the fact that the medieval thinkers introduced the "soul" at some point, whereas the behaviorists deny its very existence. Even mind and consciousness are dissolved into reactions, or conditioned reflexes. Thus, the behaviorist psychology became purely objective.

It is easy to understand that such a theory found favor in our century where mechanization and the pressure of daily life actually demanded exact and mechanical scientific methods. The explanation of human behavior as a mechanical accounting of conditioned reflexes, which have become habits, was a simplification which could not fail to appeal to certain popular tendencies. The chief flaw in the theory is that it cannot explain ideas, values, judgment, or purpose, to say nothing of moral and aesthetic ideals. Thus, behaviorism may be considered a helpful contribution to psychological knowledge, but by no means a philosophical system, as pretended by some behaviorists. In philosophy, behaviorism is a variation of extreme pragmatism (*q.v.*). See also *Psychiatry.*

Behemoth (*bē-hē′mŭth*), a large animal described in the Bible (Job 40:15-24). The description indicates that the animal referred to is grass-eating and lives in or near the water, hence it is thought the author referred to the hippopotamus. In Job 40:25-31, it is associated with the leviathan. Some writers think that the crocodile, the ox, or the elephant was meant, while others associate the two names with primeval monsters.

Behistun (*bā-hĭs-to͞on′*), or BISUTUN, a town in Persia, located near a mountain of the same name, noted for ancient sculptures and inscriptions found in the vicinity, the most remarkable of which is in limestone, 300 ft. up the mountain. This inscription, which was copied by Sir Henry Rawlinson (*q.v.*), was made about 518 B.C. and contains an account of the military triumphs of Darius I, king of Persia. It is written in cuneiform and in the Median, Persian, and Assyrian languages.

Behring (*bā′rĭng*), EMIL ADOLF VON, physician, born in Hansdorf, Germany, in 1854; died in Marburg, April 1, 1917. He studied medicine in Berlin and in 1880 took up surgery in the army. In 1894 he became professor at the Univ. of Halle, and from 1895 he taught at Marburg. He is noted chiefly for his discovery of diphtheria serum and its successful use as an immunizing agent. He was awarded the 1901 Nobel Prize in medicine. His chief books, "The Resistance to Infectious Diseases" and "The Blood Serum Therapy," marked a new era in medical literature.

Behring Sea. See *Bering Sea*.

Behrman (*bĕr′män*), SAMUEL NATHANIEL, playwright and scenarist, born in Worcester, Mass., June 9, 1893. His second play, "The Second Man," was successful when it was produced (1927), and Behrman was immediately acclaimed as mature comedy talent by the critics. By 1929, he had begun to utilize comedy as a means of probing serious social problems, using a radical and a reactionary as central figures. His successful "No Time for Comedy" (1939) was followed by three hit adaptations of foreign works: Ludwig Fulda's "The Pirate" (1942), Franz Werfel's "Jacobowsky and the Colonel" (1944), and (with Joshua Logan) Marcel Pagnol's "Fanny" (1955). His other writings include the biography "Duveen" (1952); "The Worcester Account" (1954), an autobiographical work; and "Portrait of Max" (1960), an account of visits with the noted essayist and caricaturist, Sir Max Beerbohm.

World Wide Photo

S. N. BEHRMAN

Beirut (*bā-ro͞ot′*), or BAYRUT, or BEYROUTH, formerly called Berytus, capital and major seaport of Lebanon, 60 m. N.W. of Damascus, Syria. A commercial center, it is the main port of entry and headquarters for trade with Iraq and Jordan. It has a French and an American university as well as the Lebanese State Univ. and the Lebanese Acad. of Fine Arts. Built in the time of the Phoenicians, the city was later held by the Romans, Druses, Crusaders, Egyptians, Turks, and French (after 1918). When Lebanon became an independent republic in 1941, Beirut was made the capital. Population, *ca.* 500,000.

Beit 'Ur el-Fokha (*bāt o͝or ĕl-fō′kạ*), a town in Palestine. See *Beth-horon*.

Beit 'Ur el-Tahta (*bāt o͝or ĕl-tä′tạ*), a town in Palestine. See *Beth-horon*.

Bela (*bā′lä*), the name of four kings of Hungary, of the Arpad family. Bela I reigned 1061-63. Bela II, 1131-41; Bela III, 1173-96, and Bela IV, 1235-70.

Bel and the Dragon (*bĕl and the drăg′ŏn*), a book of the Old Testament, belonging to the Apocrypha. The Roman Catholic Church regards it a canonical book of the Bible, and the Anglican, Lutheran, and a number of other churches recommend it to be studied for edification. It was probably written in Alexandria in the Greek, and dates from the 3rd century B.C. In the Vulgate version it is part of the Book of Daniel.

Belasco (*bē-lăs′kō*), DAVID, actor, director, and playwright, born in San Francisco, Calif., July 25, 1854; died in New York, N.Y., May 14, 1931. As a child Belasco appeared in the local theaters. He joined the San Francisco Theater stock company, then became an itinerant actor and worked with some of the most noted actors of his day. He developed an ability for dramatizing novels, poems, and stories, working alone or with others. His "Madame Butterfly" (1900), with John Luther Long, and his "Girl of the Golden West" (1905) were used by Giacomo Puccini (*q.v.*) as the bases for his operas of the same names. Belasco worked with a passion for scenic realism and was a spectacular director. In New York, the Madison Square Theater, the Lyceum, and the Republic were under his direction, as well as the Stuyvesant.

Belasco built the last-named, later called the Belasco, in 1906.

Courtesy Abbe

DAVID BELASCO

Belfast (*bĕl′fȧst*), capital of Northern Ireland and seat of Antrim County, at the mouth of the Lagan River at Belfast Lough. The city is situated on both banks of the river and is surrounded by hills. The shipyards of Belfast are among the most important in the world, and some of the largest ships have been built here, including the *Titanic* (*q.v.*). The spinning and weaving of flax have made Belfast world-famous; linen is second in importance among the city's industries. The manufacture of tobacco products, aircraft, and rope, twine, and trawling nets are also major sources of income. The Royal Belfast Academical Institution, Queen's Univ., and the Coll. of Technology are located in Belfast. Until 1574 the Belfast area was land which belonged to the O'Neills, chieftains of the Clannaboye. Incorporated as a borough in 1842, Belfast was made the administrative center of a six-county region in 1920. The 17th-century advances in the linen industry made Belfast a major city from a population in 1600 of less than 500. Population, 1959, *ca.* 433,000.

Belgian Congo (*bĕl′j′n ķŏng′gō*), formerly a colony of Belgium, proclaimed the Republic of the Congo (Léopoldville), an independent state, on June 30, 1960. It is bounded on the w. by the Atlantic Ocean, the Portuguese enclave of Cabinda, and by an independent state in the French Community, proclaimed the Republic of the Congo (Brazzaville) on Aug. 15, 1960 (see *French Equatorial Africa*). It is bounded on the N. by the Central African Republic and the Sudan. It is bounded on the E. by Uganda, Rwanda, Burundi, and Tanganyika. And it is bounded on the s. by Angola and the Federation of Rhodesia and Nyasaland. The Republic of the Congo (Léopoldville) contains an area of 905,329 sq. m. and includes the principal part of the basin of the Congo River. Except for the midwinter, the climate is hot, with abundant rains. Cultivated lands produce palm, coffee, cotton, rubber, tea, cocoa, bananas, and manioc. Cattle, sheep, pigs, and goats are the principal livestock. The country is rich in mineral resources, including copper, diamonds, gold, silver, tin, cobalt, uranium, germanium, radium, zinc, coal, and iron. The output of copper in a recent year was 282,094 tons, and the output of diamonds, 14,855,000 carats. The industrialization of the country includes mills for the manufacture of textiles and for the production of palm oil. Railroads and extensive navigable rivers provide access to the main seaport at Matadi.

Various European explorers penetrated the Congo region during the 19th century, including Georg August Schweinfurth, David Livingstone, and Henry Morton Stanley (*qq.v.*). Following Stanley's explorations, the king of Belgium, Leopold II (*q.v.*), employed him in efforts which resulted in the establishment of the region as the Congo Free State under the Belgian king. The Congo was annexed by Belgium in 1908, and the charter of that year provided the basis for the government of the region under colonial status until it became independent. The country is divided into six provinces: Léopoldville, Kivu, Equator, Eastern, Katanga, and Kasaï.

In early 1960, final preparations began for the change to independent status. The Congolese government was formed, based on elections which named Joseph Kasavubu president of the new republic and Patrice Lumumba prime minister. In June King Baudouin of Belgium came to the capital city at Léopoldville and proclaimed the independence. Ill-prepared for self-rule, the republic fell into political chaos.

The population is composed of Negroes, Pygmies, and Hamites, all numbering 13,540,182 in 1959; and others, mainly Belgians, numbering 112,759.

Belgium (*bĕl′j′m*), a constitutional monarchy in the lowlands of northwestern Europe. It is bounded on the s. and w. by France, on the N. by the North Sea and The Netherlands, and on the E. by Germany and Luxemburg. The area is 11,775 sq. m.; the greatest length 175 m.

PHYSICAL FEATURES. By the sea there is a sandy region and farther inland the slightly raised plain of fertile soil between the Scheldt and the Meuse rivers. The Ardennes, a range of low mountains in France, Belgium, and Germany, with an altitude of up to 2,283 ft. near Malmédy in Belgium, cross the country southeast of the Meuse River. An unfertile tract, the

Campine, is in the northern part of the province of Antwerp, but this has been greatly improved by superior husbandry.

The Meuse and Scheldt Rivers, though both rise in France, are important for drainage and navigation. The Dender, Lys, and Rupel are tributaries of the Scheldt, and the Lesse, Sambre, and Ourthe flow into the Meuse. Rainfall is abundant and the average temperature is about 50° F. In summer the climate is somewhat hotter than in Great Britain, and the winters are longer and more severe.

Coal is the chief mineral and is found in fields having an area of about 550 sq. m., chiefly along the Sambre and Meuse Rivers. Marble, slate, and limestone quarries are worked extensively in the eastern part. Other deposits worked more or less extensively include copper, lead, iron, peat, and calamine.

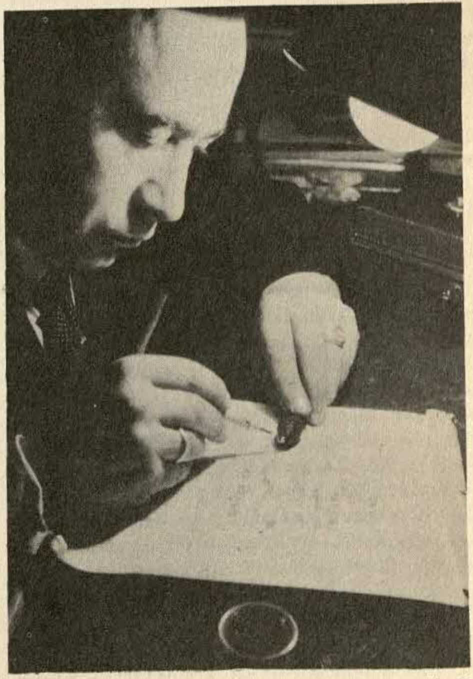
AGRICULTURE. Agriculture has declined somewhat with the development of other enterprises in which capital and labor became interested. The demand for cereals and other farm products is greater than the supply. All of the domesticated animals of Europe are raised profitably, especially cattle, and the dairying interests have been developed very efficiently. Among the cereals may be mentioned oats and wheat, which are grown most extensively, barley, rye, potatoes and fodder and sugar beets. Hops, flax, fruit, and vegetables are grown; tobacco production is negligible. About one-sixth of the surface is covered with forests, including beech, oak, elm, and poplar. Forestry is important as an enterprise, and the products have a high annual value. The fisheries of its coast and inland waters yield large returns.

MANUFACTURES. Manufacturing takes high rank as a contributor to the Belgian economy. As a member of the Benelux economic union and of the European Coal and Steel Community, Belgium enjoys a status which has a considerable impact on the distribution of her manufactures. Among the traditional chief enterprises is the manufacture of textiles, both linen and woolen, and this industry is represented at Bruges, Brussels, Limburg, Ghent, Liége, and Mechlin. Carpets are made in large quantities at Brussels and Tourney, and Brussels and Bruges are centers for the manufacture of lace and fine lawn and damask fabrics. Other products ranging high in value are machinery, leather, chemicals, glass, furniture, clothing, jewelry, and spirituous liquors. Cheap fuel has caused the development of large steel and iron works, though the ores are mostly imported. Mining is as important in the commerce of Belgium as manufacturing.

TRANSPORTATION. A network of railroads covers the entire country, and in proportion to its area Belgium has the greatest railroad mileage in the world. In 1835 the first line, from Mechlin to

Courtesy Belgian Information Center, N. Y.

BELGIAN FISHERMAN MENDING HIS NET



Courtesy Belgian Information Center, N. Y.

BELGIAN DIAMOND CUTTER AT WORK

VIEW OF GHENT

One of Belgium's oldest cities

Brussels, was open for traffic. The government owns nearly all of the railroads, which aggregate a total of over 6,500 m. Electric lines are operated in all the cities and many suburban districts. Canal transportation of much value is utilized, and the Meuse and Scheldt Rivers are navigable throughout their entire length in Belgium. The import and export trade is carried largely through Ostend and Antwerp. The imports exceed the exports; The Netherlands, West Germany, the U.S., France, and Great Britain have the largest proportion of trade, in the order named.

Population. Belgium is so named from its early inhabitants, called Belgae, a Celtic stock. Two types make up the present population, those who descended directly from the Belgae, and those who are a mixture of Celts and Germans. French is spoken in the southern part, while Flemish (*q.v.*) is the language of the northern section; both are official languages. Brussels, the capital, is a large and prosperous commercial center. Other cities of importance include Antwerp, an important seaport, Ghent, Bruges, Liége, Verviers, and Namur. Belgium is the most densely populated country in Europe. Population, 1951, 8,703,119.

Most of the Belgians are Roman Catholics. No official statistics exist concerning membership of the various faiths, since there is complete separation of secular and church affairs. A tradition of full religious liberty has long been adhered to, however, and ministers of all denominations receive a part of their income from the state.

Education. Education is free and compulsory for children between 7 and 14. The state and local governments support all the schools—including the elementary schools in the *communes* and the secondary schools where the curriculum has been traditionally classical. In addition, there are two state universities, one at Ghent and the other at Liége. The Univ. of Brussels is privately endowed, while that at Louvain is a Roman Catholic institution. The combined student enrollment of these institutions is about 17,500 annually. The specialized schools include a military academy at Brussels and the Royal Acad. of Fine Arts at Antwerp.

Government. Belgium is a constitutional monarchy, with legislative powers vested in the hereditary king (incumbent, Baudouin I), the senate, and a chamber of representatives. Members of both houses serve four-year terms. In the upper house, 101 senators are directly elected by the people, 44 by the provincial councils, and 22 by the senate itself; all 202 representatives are popularly elected. The lower house originates all bills dealing with revenue. The king, whose crown is in the direct male line of descent, is the sole executive, although he is directly assisted by a council of ministers, responsible to the two chambers. Every royal act must be validated by a minister's signature.

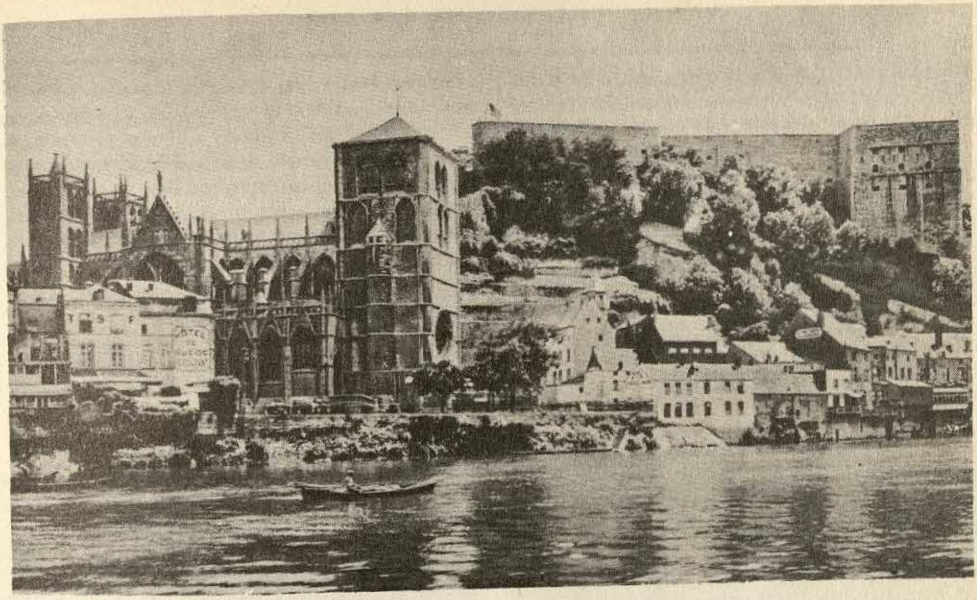
Belgium's nine local provinces of Limburg, Namur, Luxemburg, Brabant, Antwerp, Liége, Hainaut, East Flanders, and West Flanders, enjoy a large measure of self-government. They are further subdivided into smaller districts, known as *communes,* of which there were 2,666 in 1953.

The country's judicial system is divided into 26 districts, each with its court of first instance. Capping the judicial structure, which is based on trial by jury, is one court of cassation. Judges are appointed for life.

A standing army of 60,000 officers and men, a token navy, and a small air force are maintained. The army is intended only for national defense. Military training for 21 months is compulsory for men between 19 and 35.

The franc is the unit of currency (see *Coins*).

History. Present-day Belgium was known to the Romans as part of Gaul (*q.v.*). After the Roman conquest, it was administered as part of the province of Belgica. The region was the battleground and center of contention in many European wars, and its territory has belonged to many different nations. The Battle of Waterloo was fought in the province of Brabant, in 1815, after which it was united to Holland, the two countries forming the kingdom of The Netherlands. In 1830 Belgium was separated from Holland and became a distinct kingdom, forming a constitutional monarchy. Prince Leopold of Saxe-Coburg was elected



TENTH-CENTURY FORTRESS AT HUY, BELGIUM

During World War II the structure was used as a German concentration camp for Belgians

its first king, in 1831, with the title of Leopold I. He was succeeded after a prosperous reign of 34 years by his son, Leopold II, who encouraged the explorations of Sir Henry Stanley in central Africa. The Berlin Conference (1884-85) recognized Leopold II as the head of the Congo Free State. Belgium completed annexation of the territory and governed it under a colonial charter (1908) until King Baudouin's proclamation of its independence on June 30, 1960.

Albert I (*q.v.*) succeeded his uncle in 1909. At the outbreak of World War I (1914), the Germans invaded Belgium and took possession of almost the entire country before the end of the year. Although she actively resisted the aggressor, Belgium suffered greatly during the German occupation, which ended in November 1918. Albert I died in 1934 and was succeeded by his son, Leopold III (*q.v.*).

Until 1936 Belgium allied herself with France, but in that year she proclaimed her neutrality. Despite recognition of this status by the Great Powers and the conclusion (1937) of a nonaggression pact with Germany, Belgium was invaded again by German forces in World War II (May 10, 1940). The army surrendered on May 28, although a government-in-exile joined the Allies in waging war from England. In the course of the Anglo-American invasion of Western Europe in 1944, Belgium was liberated from the German occupation.

Postwar Belgium made great strides in the reconstruction of her economy and formed a customs union with The Netherlands and Luxemburg in 1947. The union was named Benelux, from the first few letters in the names of the individual states. In 1948 Belgium joined The Netherlands, Luxemburg, France, and Great Britain in a 50-year defense pact and participated in the European Recovery Program (*q.v.*). In 1949 she signed the North Atlantic Treaty (*q.v.*), and in March 1954 the Belgian senate concluded parliamentary ratification of the European Defense Community documents.

Because of the removal of King Leopold III to Germany as prisoner of war, his brother was installed as "Regent of the Realm" by parliament, Sept. 21, 1944. Dissension brought about by demands of former resistance groups against collaborators with the German occupying forces was alleviated by reshuffling of the government early in 1945. In the summer, King Leopold III was virtually exiled by the legislature for his surrender to Germany in 1940. Leopold III remained in exile until 1950 when his return was approved by a plebiscite (March 12). The king resumed his throne in July, but was forced by public demonstrations to give up his royal powers (Aug. 11) in favor of his son, Prince Baudouin.

Belgrade (*bĕl′grăd*), the capital of Yugoslavia, at the junction of the Sava and the Danube rivers. The chief buildings include the cathedral, the public library, the national theater, and the former royal palace. The city produces numerous manufactures. The Greeks were in possession of Belgrade until 1073, when it was captured by the Hungarians. Later it fell into the hands of the Bulgarians, Serbians, Austrians, French, and Turks. In 1862 it became the capital of Serbia and was finally evacuated by the Turks in 1867. Belgrade was captured by the Austrians in 1914 (in World War I) and by the Germans in 1941 (in World War II), but it was liberated Oct. 20, 1944, by the forces of Marshal Tito and the Red Army. Population, *ca.* 300,000.

Belief (*bē-lēf′*), the mental act or operation of accepting as true and real any proposition on proof afforded by reasoning, or any alleged fact or opinion on evidence of testimony. It stands in opposition to the conviction that results from personal observation or experience, which is stronger than that resting on testimony or reasoning. The term *belief* is also used to express unwavering acceptance of anything as true.

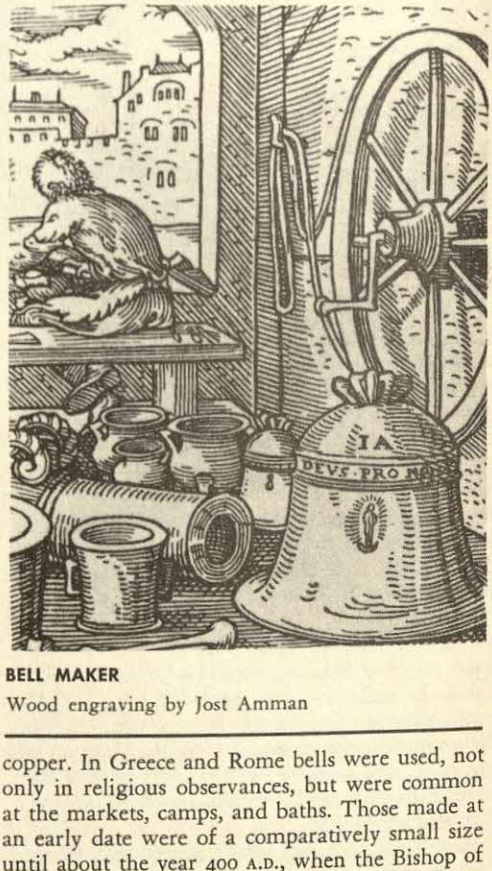
Belisarius (*bĕl-ĭ-sā′rĭ-ŭs*), military leader, born in Illyria in 505; died Mar. 13, 565. Justinian I, Emperor of Byzantium, gave him chief command of the army in Asia, and in 530 he defeated the Persians at Dara. Two years later he suppressed an insurrection against Justinian at Constantinople, and defeated the Vandals in Africa and took Gelimer, their king, a prisoner in 534. He was made consul in 535, and subsequently commanded in wars against the Bulgarians and Ostrogoths. Charged with treason by his enemies, he was put in prison, but after six months was released and restored to his honors. Writers have praised him for his loyalty and humanity.

Belize (*bē-lēz′*), the capital of British Honduras, Central America, located on Honduras Bay, at the mouth of the Belize River. It is the center of an important import and export trade in rosewood, cedar, logwood, mahogany, sugar, cocoanuts, and other tropical products. The city is well built. It has extensive telegraph connections, a good harbor, and several fine schools and churches. Population, 1921, 10,580; in 1930, 12,848.

Belknap (*bĕl′năp*), GEORGE EUGENE, rear admiral, born at Newport, N.H., Jan. 22, 1832; died in 1903. He entered the navy as a midshipman in 1847, and commanded the *New Ironsides* during the larger part of the Civil War. Subsequently he made deep-sea soundings between the U.S. and Japan for a route of a submarine cable across the Pacific. In 1885 he was made commodore, and the same year became superintendent of the U.S. Naval Observatory.

Belknap, WILLIAM WORTH, soldier, born near Newburgh, N.Y., Sept. 22, 1829; died Oct. 13, 1890. He studied at Princeton Coll. and began the practice of law at Keokuk, Ia. In 1861 he entered the Union Army as major of volunteers, and distinguished himself in the campaign conducted by Sherman at Atlanta. President Grant made him Secretary of War for both of his administrations. In the last term he was impeached for receiving bribes, but the proceedings were dropped by the Senate after his resignation.

Bell (*bĕl*), an instrument for producing a ringing sound, made chiefly of a kind of bronze called *bell metal.* It consists of a reversed cup, at the apex of which an ear or canon is formed, used for suspending it from a beam or some fixed body above. On the inside is a hammer or clapper, which generates the sound by percussion on the reversed side of the cup. In Exodus 28:33-34, golden bells are mentioned in connection with worship. The antiquity of bells is also shown by the discovery of Sir Austin Layard (1819-94) at the site of the ancient city of Nineveh, where he secured bells made of one part tin and 10 parts copper. In Greece and Rome bells were used, not only in religious observances, but were common at the markets, camps, and baths. Those made at an early date were of a comparatively small size until about the year 400 A.D., when the Bishop of Nola introduced the use of larger sizes in Campania. Their use in England began in the 7th century, and they were first cast in that country about 940, but in Ireland and Scotland they were probably used at an earlier date. The great bell of St. Paul's Cathedral in London was cast in 1882. It has a diameter of 9.07 ft. and weighs 35,470 pounds. The bell of Westminster, known as Big Ben, was cast in 1856 and weighs 30,324 pounds.



BELL MAKER

Wood engraving by Jost Amman

Bells are now in common use in churches, either singly or in a series, and are employed extensively elsewhere, principally in schools or as warning signals. Some bells are famous in history on account of their large size, beauty, and clearness, or some important historic event announced by their ringing. Among the most famous are the following:

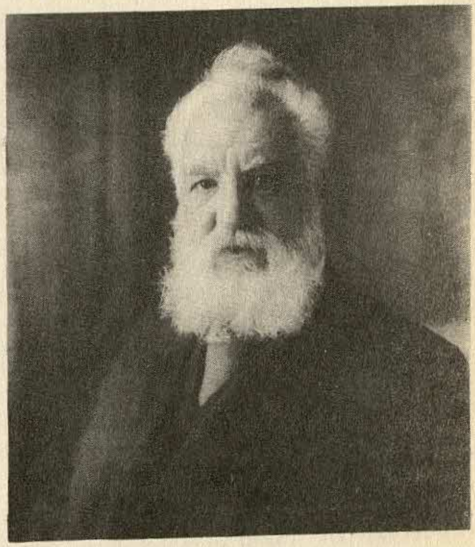
Where located	Weight in tons	When made
Cologne, Germany	11	1448
Halberstadt, Germany	8	1457
Rouen, France	16	1501
Breslau, Germany	11	1507
Lucerne, Switzerland	8	1680
Paris, France	15	1680
Vienna, Austria	18	1711
Moscow, Russia	216	1736
Montreal, Canada	13	1847
Philadelphia, United States	2	1752

Several of these bells have been recast, notably the Kaiserglocke at Cologne, in 1875, which now weighs 25 tons. The great bell of Moscow is the largest ever made, and hung suspended only a short time, owing to a fire. It now serves as a dome to a chapel that was excavated below it. The famous Liberty Bell, which rang when the Declaration of Independence was issued in 1776, was made in 1751-2. Montreal, Canada, has the largest bell in America, weighing 13 tons.

The material used chiefly in making bells, known as bell metal, consists of an alloy of tin and copper with a little zinc and lead added. In England and Germany good results have been secured by casting bells of cast steel. Glass has been used with excellent results as to tone, but it lacks durability. Bells are cast in molds made of fine sand. The molten metal is drawn off from a great furnace into an earthen or crucible pot, which is swung by a crane. The molten metal is poured over the mold into a pit beneath the floor of the foundry. When the bell has been cast, it is drawn out of the pit and its rough places are finished with files and chisels. The size of the bells and their thickness depend upon the purpose they are to serve. The small bells are proportional in weight to the larger ones, and are rung by means of ropes, which cause them to swing to and fro. Others are struck by hand, and some by means of a hammer on the outside. *Curfew bells* are rung in some towns to warn the people that it is time to retire, *fire bells* give warning of and indicate the location of fire, and *church bells* call to service, or toll the announcement that death has visited the community. Many churches in the larger cities have chimes, which consist of a set of bells, that can be played like a musical instrument.

Electric bells provide a means of signaling from remote locations. There are two types, the vibrating and the single-stroke bell, both operated by electromagnets (see *Coil*). The vibrating bell rings as long as current is supplied to the bell (*e.g.*, the familiar pushbutton doorbell); in the single-stroke bell, only one blow of the hammer strikes the bell regardless of how long current is supplied (*e.g.*, the modern multi-tone door chime). Large electric bells, as for schools and for fire and burglar alarms, are commonly called gongs.

Bell, ALEXANDER GRAHAM, scientist and inventor, born in Edinburgh, Scotland, Mar. 3, 1847. He was educated at the high school and the Univ. of Edinburgh and came with his father to Canada, making his home at Brantford. His father, Alexander Melville Bell, was the inventor of a system of instruction for deaf mutes, which the son introduced in America. He became professor of vocal physiology at the Boston Univ. in 1872, and while there invented the telephone. His invention was first exhibited in Philadelphia in 1876, but since then many improvements have been made to bring the telephone to its present state of efficiency. In 1880 he and Taintor introduced the *photophone*, an instrument in which a vibratory beam of light takes the place of a wire in conveying speech. The *graphophone*, an instrument to reproduce the human voice and similar to the Edison phonograph, was also invented by him. He wrote extensively on electricity and attained to prominence as a member of many scientific societies. He gave over $60,000 to establish the periodical *Science*, was a regent of the Smithsonian Institution and founded the Volta Bureau. He died Aug. 2, 1922. See *Telephone*, and color plate, *Means of Communication II*, Volume II.



Courtesy Harris & Ewing, Washington, D. C.

ALEXANDER GRAHAM BELL

Bell, ANDREW, clergyman, born at St. Andrews, Scotland, in 1753; died at Cheltenham, Jan. 27, 1832. He studied at the St. Andrews Univ., and in 1789 went to India, from whence he originated the "Monitorial System of Education," which, as the name implies, utilizes some of the advanced pupils of the school or system of schools to aid in giving instruction. Besides writing on educational subjects, he lectured extensively, and at his death left $600,000 for the establishment of schools in the British Isles. He was buried in Westminster Abbey.

Bell, SIR CHARLES, surgeon, famous for his discoveries in the nervous system, born at Edinburgh, Scotland, in 1774; died near Worcester, Apr. 29, 1842. He was admitted as a member to the Edinburgh Coll. of Surgeons, and later became one of the surgeons of the Royal Infirmary. To gain practical knowledge of gunshot wounds, he visited the Battle of Corunna in 1809 and the Battle of Waterloo in 1815. He published many works on different phases of anatomy and surgery.

Bell, HENRY, engineer, born in Linlithgow, Scotland, Apr. 7, 1776; died Nov. 14, 1830. He took up the business of a millwright and later studied ship modeling. Subsequently he made a study of mechanics at Bell's Hill and experimented with steam engines. In 1812 he supervised the construction of a small vessel called the *Comet,* which was launched on the Clyde. This vessel had a 3-h.p. engine and was the first European boat in which steam was used as power.

Bell, JOHN, statesman, born at Nashville, Tenn., Feb. 15, 1797; died Sept. 10, 1869. After practicing law successfully, he became a member of the State Senate, and in 1827 was elected to Congress from Tennessee, serving till 1841. He was speaker of the House from 1835 until 1837. In 1841 President William Henry Harrison appointed him Secretary of War, and in 1847 he was elected U.S. Senator from Tennessee, which position he held until 1859. Politically he was a Whig. In 1860 he became the candidate of the Constitutional Union party with Edward Everett for Vice President, and received the electoral votes of three states.

Bell, ROBERT, surveyor and geologist, born in Toronto, Canada, June 3, 1841; died in 1917. He studied at McGill and Edinburgh Univs., and later became a member of the American Institute of Mining Engineers. He joined the geological survey of Canada in 1857, and devoted nearly 50 years to making geological and topographical surveys in the Dominion of Canada. Among his important surveys are those of the south coast of Baffin Land, the great rivers of Northwestern Canada, and many of the lakes, including Lake Winnipeg, Great Slave Lake, and Lake of the Woods. The Bell River, a branch of the Nottaway, which flows into James Bay, was named after him. He published several hundred reports relating to geology, geography, and folklore. In 1888 he was a royal commissioner on the mineral resources of Ontario. His surveys and reports are basic and important records.

Belladonna (*bĕl-lȧ-dŏn′nȧ*), OR DEADLY NIGHTSHADE (*Atropa belladonna*), a leafy, branching, perennial herb, 3 to 4 ft. in height, native to Eurasia, but now grown in America for its medicinal properties. The specific name (Italian for *beautiful lady*) refers to its early use by women to enlarge the pupils of their eyes to make them appear more beautiful; the generic name is from Atropos, the Fate who severs the thread of life, alluding to the drug's poisonous qualities. It is widely distributed through Europe, where it grows wild in waste places. The berries, about one-half in. in diameter, are shining black, and, like all parts of the plant, poisonous to eat. The leaves, roots, and berries are important in *materia medica* (*q.v.*). As a drug it is used to relieve pain, relax spasms, decrease secretions, etc., and is valuable in examinations of the eyes. The most important principles of belladonna are the alkaloids hyoscyamine and atropine. In large doses, these are deadly. In proper solutions, they are effective as antispasmodics (in disorders of the stomach, intestines, gallbladder), and as heart and respiratory stimulants. They may also be used to minimize excess secretions from the glands of the skin, mouth (salivary glands), nasal passages, and bronchi, and of the stomach (*e.g.,* excess hydrochloric acid in ulcers). Dilute solutions of atropine and belladonna are used to dilate the pupils of the eyes, and belladonna plasters and ointments give local relief for neuralgia, hemorrhoids, etc.

Bellaire (*bĕl-âr′*), a city of Belmont County, Ohio, 5 m. from Wheeling, W. Va., on the Ohio River. It is on the Pennsylvania and the Baltimore & Ohio railroads, and is an industrial and commercial center. It is in a coal mining section. The industries include enamel ware, glass, stoves, castings, bricks, cement blocks, caskets, hardware, and clothing. There are also extensive deposits of coal, clay, salt, and limestone in the vicinity. Population, 1900, 9,912; in 1950, 12,573.

Bellamy (*bĕl′ạ-mĭ*), EDWARD, journalist, author, and political reformer, born in Chicopee Falls, Mass., March 26, 1850; died there, May 22, 1898. He studied at Union Coll. and in Germany and later was admitted to the bar. He was connected with the New York *Evening Post,* 1871-72, and later with the Springfield (Mass.) *Union.* He wrote a utopian novel, "Looking Backward, 2000-1887," of which *ca.* 400,000 copies were sold within a few years after publication. The book portrays an ideal Socialistic state in the year 2000. "Equality," a sequel to it, was published in 1897 but was not successful. He was active in promoting his theories, called Nationalism, but these, as well as his Nationalist party, missed their goals, although they might have influenced the People's party (*q.v.*) in 1892. His other literary output left no mark.

Bellay (*bĕ-lā′*), DU. See *Du Bellay.*

Bellbird (*bĕl′bûrd*), a bird native to South America and the West Indies, so named from the metallic sound of its voice, which resembles the tolling of a bell. The bill is broad and depressed and flexible at the base, and at the upper side is a tubular appendage about 3 in. in length. This hornlike growth stands erect when the bird becomes excited or utters its note. A similar bird is found in Australia and New Zealand.

Belleau Wood (*bĕ-lō′*), a small forested tract 5 m. N.W. of Chateau Thierry (*q.v.*) and 42 m. E. of Paris. Here American marines under Gen. Harbord defeated the Germans, June 6-9, 1918. Nearly 8,000 American casualties and 1,600 German prisoners were counted. The site was dedicated in 1923.

Bellefontaine (*bĕl-fown′t′n*), a city in Ohio, seat of Logan County, 50 m. N.W. of Columbus, Ohio, on the New York Central R.R. It is located 1,550 ft. above sea level, on the highest ground in the state (occupied by the Air Force as a radar installation), and contains the first concrete street (1891) in America. Metal products, small motors, and hearses are the chief manufactures. Stock raising and dairying are important. Indian Lake, an 11,000-acre state park, is 12 m. to the north, and the Ohio and Zane Caverns are nearby. First settled in 1800, the city was incorporated in 1820. Population, 1940, 9,808; in 1950, 10,232.

Belle Isle (*bĕl īl*), an island north of Newfoundland, at the northern end of the Strait of Belle Isle. Much of the surface is rocky. The area is about 15 sq. m. At the southern tip is a 470-ft. lighthouse. The Strait of Belle Isle separates Newfoundland from Labrador, and is the link between the Atlantic and the Gulf of St. Lawrence.

Bellerophon (*bĕl-lĕr′ō-fŏn*), the son of Glaucus, King of Corinth, and the slayer of Chimaera. It is related that he killed Bellerus and fled for protection to the King of Argos, who sent him to the King of Lycia with a sealed letter requesting that Bellerophon should fight with Chimaera, a fire-breathing monster. He mounted the winged horse Pegasus, and slew the monster in midair. He also defeated the Amazons. Sophocles and Euripides made Bellerophon the subject of tragedies.

Belleville (*bĕl′vĭl*), county seat of St. Clair County, Ill., about 14 m. S.E. of St. Louis, in a farming and coal-mining country. It is on the Southern, the Illinois Central, and the Louisville & Nashville R.R.'s. It is a commercial and manufacturing center. Its manufactures consist of stoves, stencil machines, beer, woolen goods, stationery, brick, clothing, flour, and machinery. Scott Air Force Base is located here. The town was settled in 1814 and incorporated in 1819. Population, 1940, 28,405; in 1950, 32,721.

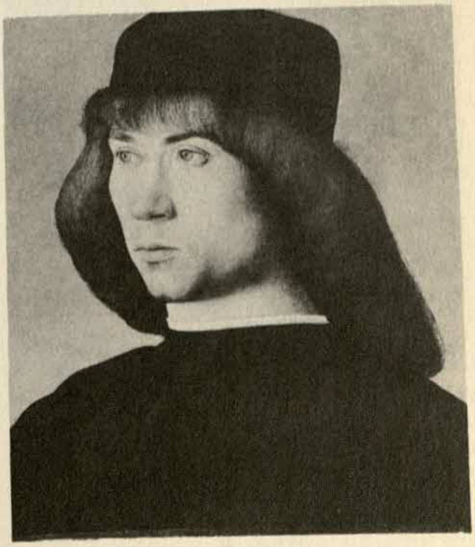
Belleville, county seat of Hastings County, Ontario, Canada, on the Canadian National and Canadian Pacific Rys. It is on the Bay of Quinte, at the mouth of the Moira River. The manufactures include ironware, clothing, cement, locks, paper, alcohol, and dairy products. It has several educational institutions, including an asylum for the deaf and dumb and Albert Univ., founded in 1857. Population, 1951, 19,519.

Bellevue (*bĕl′vū*), a city in Campbell County, Ky., on the Ohio River, opposite Cincinnati, O. It was incorporated in 1871. Population, 1950, 9,040.

Bellingham (*bĕl′ĭng-hăm*), county seat of Whatcom County, Wash., 88 m. N. of Seattle, on the Northern Pacific, the Great Northern, and the Chicago, Milwaukee, St. Paul & Pacific R.R.'s. It is located on Bellingham Bay, which is part of Puget Sound, and has a large coastwise trade; it also trades with Alaska and the Orient. The principal industries are plywood, pulp, alcohol, paper and cardboard, shipbuilding, salmon fishing and canning, lumber milling, furniture, cement, frozen food processing, and fruit and vegetable canning. Other industries include machine shops, a chain and forge plant, boiler works, and wooden pipe and cross arm manufacture. Coal mines are operated in the vicinity, and the surrounding country is devoted to dairy farming and fruit culture. The chief buildings are the Western Washington Coll. of Education and the high school. The first settlers arrived in 1853. Bellingham dates from 1903 when the towns of Fairhaven and Whatcom were united to form the city. Population, 1940, 29,314; in 1950, 34,112.

PORTRAIT OF A YOUNG MAN
BY GIOVANNI BELLINI

Courtesy National Gallery of Art, Kress Collection



Bellini (*bĕl-lē′nē*), JACOPO, painter, born in Venice, Italy, in 1395; died in 1470. He and his two sons, Giovanni (1426-1516) and Gentile (1427-1507) are considered the founders of the Venetian school of Renaissance painting, which, in contrast to the Florentine and Umbrian schools, stresses color and atmospheric effects more than line and form. This preference for color may be explained partly by Venice's location by the sea, where the moist air created color effects unknown to the inland. Also, the role of Venice as the main import harbor for Oriental goods no doubt had strong coloristic influences. The two sons are even of greater importance for later painting than Jacopo Bellini. One of them, Gentile Bellini, was called to the court of Sultan Mahomet II in Constantinople; this visit may explain the numerous Oriental figures in his paintings. Besides religious pictures, both brothers painted historical pictures in which landscape began to be notable. Their paintings are represented in the major museums of Europe and America.

Bellini, VINCENZO, famous composer, born at Catania, Sicily, Nov. 3, 1802; died near Paris, France, Sept. 24, 1835. He studied composition at Naples under Zingarelli, wrote operas before reaching the age of 20, and was patronized by the principal musical establishments of Europe. His operas include many productions filled with sweet melodies, among them *"La Sonnambula,"* "Norma," *"El Pirata,"* and *"I Puritani."*

Belloc (*bĕl′lŏk*), JOSEPH HILARY PIERRE (known as *Hilaire Belloc*), author, born at La Celle, St. Cloud, France, July 27, 1870. He was educated at Balliol Coll., Oxford, and became a naturalized British subject in 1902. He served as M.P. for Salford (1906-10), first as a Liberal and subsequently as an Independent. Shortly after taking his Oxford degree in 1883, he entered upon a literary career which has been notable for its variety as well as for its wit, cogency, and significance; he is especially noted as a protagonist of the Catholic tradition. Among his published works are volumes of poetry "Verses and Sonnets" (1924); historical studies, "Characters of the Reformation" (1940); satires, "But Soft—We Are Observed" (1928); biographies, "Robespierre" (1901); and essays, "On Nothing" (1908). He died in Guilford, England, July 16, 1953.

Courtesy Harper & Bros., Publishers, N. Y.

HILAIRE BELLOC

Bellona (*bĕl-lō′nȧ*), the Roman goddess of war, sometimes confused with Minerva. Her temple stood in the Campus Martius, near the circus of Flaminius, and was of great importance in the time of the republic. The 24th day of March was set aside for her worship.

Bellows (*bĕl′ōz*), a machine or instrument for producing a blast of air, used principally for blowing fires in furnaces and forges, or for filling pipe organs. It was used by the ancients, both nomadic and civilized. The common bellows are made by joining two wooden sides together with leather stretched entirely around, and so fastened that two handles moved back and forth cause air to be forced out through the nozzle. A valve on the side admits the air as the handles are moved apart, but closes when they are brought together. This results in the air being driven out with much force. Powerful instruments designed for factories or workshops were operated by machinery. For most industrial purposes motor-driven fans have now superseded bellows, as they provide continuous currents of air. See also *Blowing Machine; Fan.*

Bellows, ALBERT FITCH, landscape painter, born in Milford, Mass., in 1829; died in Auburndale, Mass., in 1883. His first art expression was through architecture, which he practiced in Boston before turning to the study of painting in Antwerp, Paris, and England. After using oils at the beginning of his career, he became one of the pioneers in painting with water-colors. Among his works are "Sunday in Devonshire" and "The Parsonage."

Bellows, GEORGE W., painter and lithographer, born at Columbus, Ohio, in 1882; died in 1925 in New York City. After studying at Ohio State Univ., he went to New York in 1904 to study painting. In 1909 he was elected Associate of the National Acad. of Design, the youngest to be elected to the academy up to that time. His art is vital, his brush stroke strong and expressive. Although Bellows owed much to French Impressionism, he succeeded in utilizing these stimuli for vivid representation, through all his work, of the American scene. His best-known works include: "Picket Fence," "Gramercy Park," and "Dempsey and Firpo."

Bell Rock (*bĕl rŏk′*), or INCH CAPE, a reef of rocks in the North Sea, opposite the mouth of the Tay, about 12 m. from Arbroath, Scotland. The danger of this reef to navigation has been partly overcome by a large lighthouse, erected in 1810 under the direction of Robert Stevenson. The lighthouse is 120 ft. high, has an alternating red and white revolving light, and has two bells which are rung during storms. The reef, which is about 2,000 ft. long, is partly uncovered at spring tides.

Courtesy Metropolitan Museum of Art, N. Y.

UP THE HUDSON, PAINTING BY GEORGE W. BELLOWS

Bell's Palsy (*bĕlz pôl'zȳ*). See *Paralysis.*

Belmont (*bĕl'mŏnt*), AUGUST, financier, born at Alzey, Germany, in 1816; died in New York City, Nov. 24, 1890. He was educated at Frankfort and was employed by the Rothschilds as their agent in New York. In 1844 he was made consul general at New York by the government of Austria, and subsequently served as American minister to Holland, having become an American citizen. He was chairman of the national Democratic committee for 12 years, beginning in 1860. During the Civil War he furnished much valuable information to the U.S. government, and aided in preventing the Confederacy from floating loans in the foreign money market.

Belmont, AUGUST, financier, born in New York City, Feb. 18, 1853; died Mar. 29, 1919. He succeeded his father, August Belmont, in the management of the banking house of August Belmont & Co., American representatives of the banking firm of the Rothschilds, and became an officer and director of many corporations interested in railroads and manufacturing. In politics he affiliated with the opponents of Bryan in 1896, and was influential as a Democrat in state and national organization. He held important offices in the company that controlled the consolidated traction lines of the city of New York.

Beloit (*bê-loit'*), a city of Rock County, Wisconsin, on the Rock River, about 90 m. N.W. of Chicago and 45 m. S.E. of Madison, on the Chicago & North Western and the Chicago, Milwaukee, St. Paul & Pacific R.R.'s. It has factories which produce scales, dies, paper and paper machinery, shears, cutlery, hosiery, engines, grinding machines, boots and shoes, engines, and machinery and is a regional electric power center. Besides having good public schools, it is the home of Beloit Coll., an institution of liberal arts. The chief buildings include the public library and the central high school. It was first settled in 1824 and was incorporated in 1856. Population, 1940, 25,365; in 1950, 29,590.

Belshazzar (*bĕl-shăz'ēr*), the last king of the Chaldean dynasty, who, according to some historians, ruled conjointly with his father, Nabonidus. His death occurred in 538, when Cyrus, King of Persia, conquered Babylon. For an account of the circumstances of his overthrow see the Book of Daniel.

Belt (*bĕlt*), or BELTING, in machinery, an endless flexible cord or band used to transmit power or motion between two parallel shafts. Driving belts are usually broad or flat bands of leather or rubber, but there are a vast number of forms made of different materials, such as ropes, chains, and cables, which are used to transmit power from one roller, wheel, or pulley to another. The best leather belts are made of oak-tanned leather cut from the back of hides and curried in tallow and cod oil. Under suitable care and with proper connections, belts of this kind can be used to drive machinery from 20 to 30 years. India rubber is preferred as a material for belting by a number of manufacturers, as it does not absorb moisture or stretch and decay, but its tendency to deteriorate with age makes it less durable. Iron and steel wire and chains are used extensively, but they require a peculiar contruction of pulleys. A variety of woven-fabric belts are employed, including hair, cotton, and various textile fabrics, though in general they are most serviceable in smaller machinery. The two ends of a belt may be united together by riveting, or by clamps of various construction, and in the lighter class of belting it is customary to lace the ends together with a strap of leather. Where great power is transmitted, it is necessary to have leather belts of several thicknesses, frequently as much as four layers, and the width ranges from 20 to 50 in. Heavy rubber belting is sometimes six-ply thick, from 30 to 50 in. wide, and about 300 ft. long, depending, of course, upon the construction of the machinery and the power to be transmitted.

Belt, GREAT AND LITTLE, the names of two narrow channels which connect the Baltic Sea with the Cattegat. The Great Belt is 37 m. long and about 18 m. wide, and passes between the islands of Fünen and Zealand. It has dangerous shoals and sand banks, and a swift current prevents the strait from being frozen over except in very severe winters. The Little Belt separates Fünen from Jutland. It is 30 m. long and from 1 to 12 m. wide, and in general respects resembles the Great Belt.

Beltein (*bĕl′tān*), or BELTANE, a festival common among the Celtic people, which was celebrated annually in the beginning of May. Some writers have associated it with fire worship or with the worship of the sun, while others regard it a season for burning rubbish at the time of cleaning house yards. In some localities festivals known by this name were celebrated in the month of November.

Beluchistan (*bȧ-lōō-chĭ-stän′*). See *Baluchistan.*

Beluga (*bĕ-lōō′gȧ*), or WHITE WHALE, a kind of whale or dolphin found in the Arctic Sea. It has a broad head, is from 10 to 15 ft. long, and is hunted for its skin and oil, known as *porpoise oil.* The sturgeon of Southern Russia is known as beluga. Isinglass is made from its swim bladder, and caviar from its roe.

Belvidere (*bĕl′vĭ-dēr*), a city in northern Illinois, seat of Boone County. Located on the Kishwaukee River, 12 m. E. of Rockford, Ill., it is served by the Chicago and North Western Ry. Belvidere is an industrial center in an area devoted largely to dairying and stock raising. The major products are machine tools, bottle caps, paper cups, and canned foods. Settled in 1836, Belvidere was incorporated as a city in 1861. Population, 1960, 11,223.

Belzoni (*bĕl-tsō′nē*), GIOVANNI BATTISTA, explorer, born in Padua, Italy, Nov. 5, 1778; died Dec. 3, 1823. He emigrated to England in 1803 and subsequently went to Egypt at the invitation of Mehemet Ali, for whom he made a hydraulic machine. While in Egypt he explored the antiquities at Gizeh and in the region between the Nile and the Red Sea. He secured a colossal bust of Rameses II, now in the British Museum, and opened one of the pyramids of Gizeh. He published "Operations and Discoveries in Egypt and Nubia."

Bem (*bĕm*), JOZEF, revolutionist and patriot, born in Galicia, Austria, in 1795; died Dec. 10, 1850. He joined the French under Napoleon, and subsequently entered the Polish army. In 1884 he took command of the army of Transylvania, consisting of 10,000 men. He was at first unsuccessful, but later defeated the Austrians at the bridge of Piski, and in 1849 repulsed them and their Russian allies. However, he was defeated at Schässburg in 1849, and was compelled to retreat into Transylvania. He obtained a command in the Turkish army. In 1850 he curbed an Arab insurrection at Aleppo, and soon after died of a fever.

Bemelmans (*bĕ′mĕl-manz*), LUDWIG, writer and illustrator, born in Meran, Austrian Tyrol; died in New York City, Oct. 1, 1962. He came to the U.S. in 1914 and was naturalized in 1918. During World War I he enlisted in the American army, undergoing the experiences humorously described in his book "My War with the U.S.A." (1937). This book established his reputation as a humorist. His style was adapted to juvenile ("Hansi," 1934, and "Madeline," 1939, etc.) and adult books ("Hotel Splendide," 1939, "Dirty Eddie," 1947, "The Woman of my Life," 1957, "On Board Noah's Ark," 1962). His witty sketches were popular features of such magazines as the *New Yorker,* and his paintings were formally exhibited.

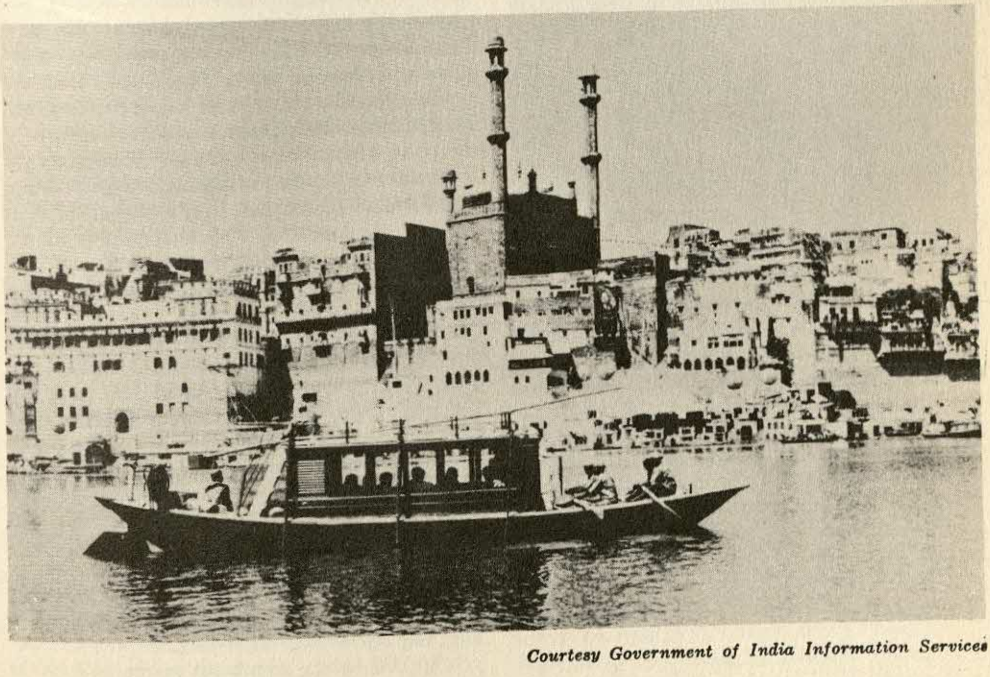
Photo by F. Stein, courtesy Viking Press, N. Y.

LUDWIG BEMELMANS

Bemidji (*bė-mĭj'ĭ*), county seat of Beltrami County, Minnesota, 180 m. N.W. of St. Paul, on Lake Bemidji and on the Northern Pacific and other railroads. Principal industries include brick and tile yards, creameries, and wood products. It is a summer resort and trade center. The place was settled in 1889 and incorporated in 1896. Population, 1950, 10,001.

Bemis Heights (*bē'mĭs hīts*), the site of a battle of the American Revolution whereby the British under Gen. Burgoyne were prevented from splitting American forces in the Hudson Valley. Unable to join his ally St. Leger, whom Herkimer had turned back at Oriskany on the Mohawk, Burgoyne proceeded to Stillwater, above Albany, where Gates defeated him Oct. 7, 1777. Ten days later Burgoyne surrendered, a success which encouraged the French-American alliance of 1778.

Benares (*bĕn-ä'rĕz*), a city in the northern part of India held sacred by the Hindus. It is the focus of a network of railroads, on the Ganges River, which makes a turn at this place. The site on which the city is built rises like an amphitheater, thus presenting a magnificent view of its beautiful palaces, mosques, and other buildings. The city is the residence of many priests. Vast numbers of religious mendicants and Hindu pilgrims wend their way to this revered city to worship in its ancient edifices, or to temporarily wash away their sins in the sacred waters of the Ganges. Historically sacred bulls wander at large to indicate the sacredness of the city. There are no less than 1,500 Hindu temples within the city limits, besides 275 Mohammedan mosques. Benares is surrounded by a fertile district and has a large trade in merchandise. The manufactures include utensils, embroidered cloth, clothing, shawls, silk, jewelry, and other Eastern products. A portion of the city is occupied by Europeans, who founded a government college which is now attended by about 1,250 students. They constructed a beautiful



Courtesy Government of India Information Services

BENARES

Transportation down the Ganges River

bridge across the Ganges River, containing 16 spans. Little is known of the early history of the city. According to Hindu tradition it was founded at the time of the creation. Population, *ca.* 200,000.

Benavente y Martinez (*bā-nä-vĕn'tâ ē mär-tē'nāth*), JACINTO, poet and dramatist, born in Madrid, Spain, Aug. 12, 1866; died there, July 14, 1954. He studied law, but, deciding to become a writer, in 1893 he published his first book of poetry and prose sketches, *"Cartas de mujeres."* His reputation was established by three plays, produced between 1894 and 1898, "Thy Brother's House," "In Society," and "The Banquet of Wild Beasts." These were followed by a number of socio-satirical comedies, and it was not until 1913 that he produced his first serious play, *"La Malquerida."* Benavente was also a lecturer of note and a frequent contributor to newspapers and magazines. In 1922 he received the Nobel Prize for his contribution to Spanish literature. A collection of his works was published in 1940 under the title *"Obras completas."*

Benchley (*bĕnch'lȳ*), ROBERT CHARLES, humorist, born in Worcester, Mass., Sept. 15, 1889; died Nov. 21, 1945. His editorial abilities were employed successively by Curtis Publishing Co. (1912-14), the *Herald Tribune,* N.Y. (1916-17), *Vanity Fair* (1919-20), *Life* (1920), and the *New Yorker* (1929-40). Benchley wrote, directed and acted in the motion picture, "How to Sleep," winner of the 1935 Academy Award. He appeared in many other "short" screen features, and on radio programs after 1937. Among his entertaining books are "Of All Things" (1921), "The Early Worm" (1927), "From Bed to Worse" (1934), and "After 1903, What?" (1938), and "Inside Benchley" (1942).

Bendix (*bĕn'dix*), VINCENT, inventor, born in Moline, Ill., in 1882; died Mar. 27, 1945. He ran away from home at the age of 16, to go to New York, where he worked as an elevator operator and as a stenographer in a law office before he took up the study of mechanics. His first important invention was the Bendix self-starter drive for automobiles, which he placed on the market in an automobile of his own design. He founded the Bendix Aviation Corp. in 1929 and by the time he resigned as president, 13 years later, had developed it into one of the leading concerns in its field. Two years after he resigned, he formed Bendix Helicopter, Inc., which was ready to begin production at the time of his death. An international figure in the field of aviation, he sponsored the Bendix Transcontinental Air Race. Bendix's long list of inventions and mechanical improvements ranged from his early self-starter drive to the modern helicopter, including generators, radio direction apparatus for ocean-going vessels, magnetos, laundry machines, landing gears, and the four-wheel brake for automobiles.

Benedict (*bĕn'ê-dĭkt*), the name of 14 Popes, who ruled within 574-1750. Benedict XIV was the most celebrated. This pontiff was born at Bologna in 1675 and died May 3, 1758. He was distinguished for extensive learning, piety, and tolerance. He established a board of examiners for all candidates to vacant sees. Among his written works are "On the Sacrifice of the Mass," "On the Beatification and Canonization of Saints," and "On the Diocesan Synod."

Benedict XV, Pope of Rome, born at Genoa, Italy, Nov. 21, 1854; died Jan. 22, 1922. He studied at the Univ. of Genoa, where he graduated in law in 1875, and later studied theology at Capranica Coll. After serving as prelate at Madrid, Spain, he was made archbishop at Bologna. In 1914, well equipped for the post by training and by nature, he succeeded Pius X as Pope. His policy in World War I was in the interest of peace.

Benedict, RUTH FULTON, anthropologist, born in New York, N.Y., June 5, 1887; died there, Sept. 17, 1948. She was graduated from Vassar Coll. in 1909. She soon gained a national reputation as a poet, publishing principally in the *Nation* and in *Poetry*. In 1919, she began to study at Columbia Univ. under the distinguished anthropologist, Franz Boas, and soon discovered that anthropology served well as a focus for her many interests. She took her Ph.D. at Columbia in 1923, and immediately embarked upon her career of teaching at Columbia and doing field work among the Apache, Pueblo, Mission, Pima, and Blackfoot Indians. Dr. Benedict's most important writings are "Patterns of Culture" (1934), an analysis of the present-day culture of Western civilization as it relates to primitive civilizations, "Race: Science and Politics" (1940), an anthropological blast at Nazi racism, and "The Chrysanthemum and the Sword: Patterns of Japanese Culture" (1946).

Benedict, SAINT, founder of the first religious order in western Europe, born in Nursia, Italy, in 480; died in 543. As a young man he went to live in a cave in the desert at Subiaco, about 40 m. from Rome. There he spent three years in prayer and meditation. He acquired many followers and later founded 14 monasteries. Eventually in 529 he founded the order of Benedictines (*q.v.*) at Monte Cassino, where he instituted the rules which have distinguished the Benedictine order, and which for centuries were the basic monastic rules in Europe. See also *Benedictine Abbey.*

Benedictine Abbey (*bĕn-ê-dĭc'tēn ăb'bȳ*), a monastery at Monte Cassino, Italy. The first structure on the site was erected in 529 A.D., but was leveled by the Lombards at the end of the 6th century. Rebuilt in 720, it was destroyed by the Saracens in 884. In the second half of the

10th century, the Abbey was rebuilt a second time, to stand for almost 10 centuries. During World War II, however, while being used by the Germans as a strongly fortified observation post and arsenal, the monastery was once again leveled to ruins, this time by Allied planes in an air assault which preceded the capture of Cassino (Feb. 1944). In 1947 the Pope issued an encyclical letter announcing that a fund for the reconstruction of the monastery was to be collected, and by 1948 the monks had begun to rebuild the abbey with their own hands.

Benedictines (*bĕn-ē-dĭk'tĭns*), an order or society of monks who observe the rules of St. Benedict. It dates from 529, when St. Benedict founded the first monastery of this order on Monte Cassino, near Naples. The rule of living has as its motto: "Pray and work"; and the day is divided into these two occupations with the necessary recreation. This work for the lay-brothers consists in plying various trades and tilling land, while the clerical members are occupied with the study of the fine arts, teaching classics and sciences, writing, or missionary labors. They make the vows of poverty, chastity and obedience, like other religious orders, and add two others: one of stability or staying in the same monastery in which they made these vows for life, and the other of conversion of morals or aspiring for spiritual perfection. In the Middle Ages the Benedictines were concerned in the preservation of the ancient classics, and through them many art and literary treasures have been transmitted to modern times. The monks of this order include many scholars noted for their interest in disseminating knowledge. The order lays claim to the distinction that 24 of its members became popes; 200, cardinals; and 4,250, bishops.

Benediction (*bĕn-ē-dĭk'shŭn*), a minister's prayer for the transfer of grace to the worshiping people or to a single person; a blessing for an object, such as a building or a ship.

Benedictus (*bĕn-ē-dĭk'tŭs*), in the Roman Catholic Church and in the Church of England, a part of the daily lauds, or of the matins, the first or second period of the day in which prayers are said. Benedictus is a canticle from the song of Zacharias, father of John the Baptist (Luke 1:68-79).

Benefaction (*bĕn-ē-făk'shŭn*), literally, a good deed, from the Latin *benefactio* and French *bon* (well), *faire* (to do). Any helpful act may properly be termed "benefaction," but the word is most commonly used to designate that form of philanthropy which consists of donations for the advancement of arts, sciences, education, etc.

Among the better-known examples of this type of benefaction are the *Nobel* and *Pulitzer Prize awards,* the *Carnegie Corporation of New York,* the *General Education Board,* and the *Rockefeller, Hayden, Guggenheim,* and *Russell Sage Foundations.*

Benefit Associations (*bĕn'ē-fĭt*), or FRATERNAL SOCIETIES, the organizations whose aims include the cultivation of social relations, the assistance of members during times of sickness and disability, and the payment of benefits in case of death. Their business, so far as it pertains to life insurance, is conducted on an assessment basis, classified in accordance with the age of the assured. They are particularly numerous in the U.S., where the annual income of this class of fraternal societies reaches far over $200,000,000. The largest among these are the Modern Woodmen of America and the Woodmen of the World (Sovereign Camp).

Courtesy Czech Information Service, N. Y

EDUARD BENEŠ

Beneš (*bĕ'nĕsh*), EDUARD, President of Czechoslovakia, born in Kozlany, Bohemia, May 28, 1884. A liberal statesman, he was educated at Prague, Paris, and Dijon Univs. Active in the Czech nationalist movement throughout the First World War, he became foreign minister of the new state (1918-35).

Prime minister from 1921-22, he was Czech representative in the League of Nations (1923-27) and co-founder of the Little Entente (*q.v.*). Elected president of Czechoslovakia in 1935, he resigned following the Munich Pact in 1938.

After a year as professor of sociology at Chicago Univ., he went to England (1939), becoming President of the Czechoslovak government-in-exile in 1942. In June 1945, Dr. Beneš returned with the government to his liberated country and was again installed as president. He resigned his post in June 1948, shortly after the Communists seized power. He was author of many publications on political science. Considered one of the outstanding liberal European statesmen, he died on Sept. 3, 1948.

Benét (*bĕ-nā′*), STEPHEN VINCENT, poet and writer, born July 22, 1898, at Bethlehem, Pa.; died in 1943; the brother of William Rose Benét (*q.v.*). A graduate of Yale Univ. (1919), his well-known Civil War tale, "John Brown's Body" (1928), won the Pulitzer Prize for poetry in 1929 and his "Western Star," a work on early America (part of a projected poetic history of the U.S., left incomplete at his death) won the Pulitzer Prize in 1944. "Five Men and Pompey" (1915), "Heavens and Earth" (1920), "Tiger Joy" (1925), "Ballads and Poems" (1931), "The Devil and Daniel Webster" (1937), "Tales Before Midnight" (1939) are others of his works, all pervaded by his love for, and faith in, America.

Courtesy N.B.C.

STEPHEN VINCENT BENÉT

Benét, WILLIAM ROSE, author, editor and lecturer, born at Fort Hamilton, N.Y. Harbor, Feb. 2, 1886; died in New York City, May 4, 1950. Graduated from Yale University in 1907, he began free-lance writing, mostly poetry. He was associated in an editorial capacity with several periodicals, chiefly the *Saturday Review of Literature*. Some of his well-known books include "Merchants from Cathay" (1913), "The Great White Wall" (1916), "Rip Tide" (1932), and "Golden Fleece" (1935). He edited "The Reader's Encyclopedia" (1948). In 1942 he was awarded the Pulitzer Prize for poetry for "The Dust Which is God," a semi-autobiographical verse narrative written in a number of rhythms described as "modernized blank verse." His poetic style was frequently described as vivid, fresh, romantic, and colorful.

He was married to the poet ELINOR WYLIE (1885-1928), and edited her "Collected Poems" (1932) and her "Collected Prose" (1933).

Benevento (*bā-nâ-vĕn′tô*), a city of southern Italy, in a province of the same name, near the junction of the Sabbato and Calore Rivers. It occupies the site of the ancient Beneventum, and is noted for its remains of antiquity. The famous arch of Trajan, built in 114 A.D., and its cathedral, constructed after the Lombard-Saracenic style in the 12th century, are among the most noted buildings. Population, *ca.* 28,000.

Bengal (*bĕn-gạl′*), a former province of British India now divided into East Bengal (in Pakistan) and West Bengal (in India) and comprising a total area of 82,955 sq. m. The division occurred in 1947 coincident with the partition of British India. Bengali is the language spoken by about 95 per cent of the population. Partition of the region follows religious lines closely, the Mohammedans (about 54% of the former total) having joined Pakistan. Bengal is located south of the Himalaya Mts., and north of the Gulf of Bengal. Through it flow the Brahmaputra and Ganges Rivers, two valuable water courses, which, below their confluence, form the greatest delta in the world. The glaciers of the Himalaya Mts. supply the two chief rivers of the district with immense volumes of water in the months of June and July, and, like the floodings of the Nile, cause a large region to be inundated. As a result the lowlands of the delta are fertile and produce large quantities of cereals and fruits.

The mean temperature of Bengal for the year is about 80° near the coast, and in the elevated regions to the north about 54°. In the eastern part the rainfall is extremely heavy, averaging over 100 in. in a year, and is equaled only by the precipitation of the Amazon valley and the lake region of Africa. Three seasons make up the year, including the hot, from March to June; the rainy, from June to October; and the cold, from October to March. Along the coast extend great trackless forests, in which the Bengal tiger and the rhinoceros are numerous. Many reptiles and carnivorous animals infest the swamps and canebrakes of the low and marshy coast and the delta. Destructive floods occur frequently and cyclones occasionally, and earthquakes have occurred. Among the chief products are opium, cane sugar, tobacco, indigo, cotton, rice, and many varieties of tropical fruits. In the northern portions, adjacent to the foothills of the Himalayas, are extensive deposits of copper, petroleum, and coal, while salt beds are common in that region. A large commerce is carried on with Great Britain, China, the U.S., and Australasia.

The first British settlement in Bengal was made by the East India Co. in the early part of the 17th century. Calcutta was founded in the

British Official Photo

CORNER OF A BENGALESE VILLAGE

latter part of that century, and is the largest city and most important commercial center of India.

Bengal became a lieutenant-governorship in 1854, a presidency in 1911, and a province in 1937. Under the Indian Independence Act of 1947, Bengal was divided along a line which separated its Mohammedan and Hindu population into the Indian state of West Bengal and the Pakistani province of East Bengal. West Bengal (area, 30,775 sq. m.; population, 1951, 24,810,308) has its capital at Calcutta. East Bengal (area, 54,501 sq. m.; population, 1951, 42,062,610) has its capital at Dacca. An important university is located in each of the capital cities.

Although primarily an agricultural country, the region contains several large cities, notably Howrah, Dacca, Chittagong, and Calcutta. The last two are important seaports.

Bengal, BAY OF, a part of the Indian Ocean, located between India and the west coasts of Burma and the Malay Peninsula and extending from the Ganges delta south to the southern end of Ceylon. The Andaman and the Nicobar Islands are the chief land masses within the bay, which receives many rivers, the largest being the Ganges, Irrawady, and Brahmaputra. The principal port cities are Rangoon, Calcutta, and Madras. A small chain of islands centering around Cheduba Island, just off the Burmese coast, is remarkable for a group of intermittently active mud volcanoes.

Bengali (*bĕn-gạ′lē*), a branch of the Eastern group of Indo-European languages spoken in the Bengal areas of the Republic of India and Pakistan, mainly in the Ganges delta of eastern India. Calcutta is the chief educational and cultural center among the *ca.* 53,000,000 people who speak this language. There is a rich Bengalese literature, dating back to the 11th century.

Bengasi (*bĕn-gä′zē*) or BENGHAZI, one of the two capital cities of Libya, a seaport on the North African shore of the Mediterranean Sea and capital of the province of Cyrenaica. Built on the site of the ancient city of Berenice, it was originally a Greek colony which passed successively under Egyptian, Roman, and Arabic rule. The Turks captured it in the 16th century and held it until 1911, when it was occupied by Italy, becoming thereafter the center of a vast Italian colonization in North Africa. An important Italian supply base during World War II, the city changed hands a number of times before it was finally taken by British forces in 1942. Bengasi is primarily a communications center and has various light manufactures. Population, 1951 (est.), 62,300.

Benguela (*bĕng-gĕl′ȧ*), a district in western Angola. Benguela is situated in a mountainous section between the cities of Mossâmedes and Luanda. Benguela, a seaport town, and capital of the district (population, 1940, 14,243), exports beeswax, maize, cattle, and hides. It was founded in 1617 and was long a center of the slave trade.

Ben-Gurion (*bĕn-gŏŏr′ĭ-ŭn*), DAVID, Israeli statesman, born DAVID GREEN in Plonsk, near Warsaw, Poland, Oct. 16, 1886. The son of a leading Polish Zionist, he went to Palestine in 1906, where he became active in the Palestine Labor party. An opponent of Turkish rule in Palestine, he was exiled by the Turks in 1915 and went to the U.S., where he founded Hechalutz, a Zionist pioneer movement. During World War I he helped to form the U.S. branch of the Jewish Legion, in which he himself served under Gen. Allenby (*q.v.*). Resettling in Palestine in 1921, he founded Histadruth, the Socialist General Federation of Jewish Labor. In 1933 he became an executive of the Jewish Agency for Palestine and was its chairman in 1935-48. In 1948 Ben-Gurion proclaimed the independence of the state of Israel and, as head of the Socialist Mapai party, was elected prime minister and minister of defense. He retained these posts until 1953. In 1955 he came out of retirement to reassume the defense ministry and, following a general election, the prime ministership. Always an advocate of strong retaliatory measures against Arab attacks on Israel, he ordered the Israeli invasion of Egypt in October 1956. He is the author of numerous books on Zionism.

Benhadad (*bĕn-hä′dăd*), the name of three Biblical kings of Damascus. It is a Hebraic name meaning "son of Hadad." Hadad was a Semitic deity, either a weather or storm god, and probably the national god of Damascus. BENHADAD I, fl. 900 B.C., was the ally of Asa, king of Judah (I Kings 15:18ff.; II Chronicles 10:2ff.). His son, BENHADAD II, fl. 854 B.C., waged war against Ahab, king of Israel, and led a coalition against Shalmaneser III of Assyria. (I Kings 20, 22; II Kings 5, 6:24ff., 7:20, 8:7-15). He was murdered by Hazael, who succeeded him as king. BENHADAD III, fl. 805 B.C., was the son of Hazael. During his reign, Damascus was defeated by Assyria (II Kings 13:3-5, 24).

Beni (*bā'nē*), a river of Bolivia, rises in the Bolivian Andes, and after a course of 900 m. unites with the Mamoré to form the Madeira. It is navigable about half its length, and provides direct communication for a large part of Bolivia with the Amazon.

Benin (*bĕn-ēn'*), a district of Western Africa, in Upper Guinea. It is bounded by Dahomey, the Niger, and the Bight of Benin, an extension from the Gulf of Guinea. The soil is fertile and produces yams, cotton, fruit, and sugar-cane. The region was discovered and partly explored by the Portuguese in 1484. It became a possession of Great Britain in 1897, when it was incorporated in the protectorate of the Niger coast called Nigeria.

Benjamin (*bĕn'jȧ-mĭn*), "son of the right hand," the youngest son of Jacob and Rachel. He was loved by Jacob most of all his children, and was especially beloved by his elder brother, Joseph. From him one of the 12 tribes of Israel descended, known as the Benjamites. They numbered 45,600 warriors when Joshua led the hosts into Canaan. The portion allotted to them was situated between the tribes of Judah and Ephraim, on the west side of the Jordan. After the reign of Solomon, the kingdom of Judah was formed of Judah and Benjamin. These two tribes constituted the principal part of the Jewish nation after the Babylonian captivity under Nebuchadnezzar. Saul, the first King of Israel, and the Apostle Paul were Benjamites.

Benjamin, JUDAH PHILIP, called "The brains of the Confederacy," born at St. Croix, West Indies, Aug. 11, 1811; died in Paris, France, May 8, 1884. He was a descendant of Jewish parents, studied at Yale, and was admitted to the bar in 1834 at New Orleans, where he became a member of the law firm of Slidell, Benjamin & Conrad. In 1852 he was elected to the U.S. Senate as a Whig. While in office he went over to the Democratic party and was re-elected in 1857, but resigned when Louisiana seceded from the Union. He advocated the Kansas-Nebraska bill, but afterward held that the Dred Scott decision should be accepted as conclusive. He was appointed Secretary of State for the Confederacy by Jefferson Davis, which office he filled with exceptional ability. After the war he fled from Richmond to the Bahamas, and later to Liverpool. Subsequently he studied English law at Lincoln's Inn, was admitted to the bar at London, and in 1872 became a queen's counsel.

Ben Lomond (*bĕn lō'mŭnd*), a mountain in the Grampian Highlands of Scotland, 27 m. N.W. of Stirling. It is on the east side of Loch Lomond and rises to an elevation of 3,192 ft. Duchary Water, a feeder of the Forth, has its source in Ben Lomond. On clear days a fine view may be had of the surrounding country, including Loch Lomond and the fertile plains of Ayrshire and Renfrewshire. Scott in his "Lady of the Lake" makes this mountain a place of prominence.

Bennett (*bĕn'ĕt*), ARNOLD, writer, born at Hanley-in-the-Potteries, Staffordshire, England, 1867; died, 1931. Educated at London Univ., he later studied for the bar but abandoned law for journalism. Editor of the magazine, *Woman,* until 1900, he afterwards devoted his efforts exclusively to creative writing, and emerged as an eminent novelist, a playwright, and an essayist. Outstanding literary achievements are his realistic novels of the people of his native pottery-manufacturing region: "Anna of the Five Towns" (1902); "Old Wives' Tale" (1906), considered by many to be his best; "The Matador of the Five Towns" (1912); and others. Later fiction includes: "Mr. Prohack" (1922) and "Imperial Palace" (1930). Of his several plays "Milestones" (1912) and "The Great Adventure" (dramatization of his novel, "Buried Alive," 1913) are notable. In addition, he wrote numerous essays, impressions, and a "Journal," the latter published posthumously.

Courtesy Brown Bros., N. Y.

ARNOLD BENNETT

Bennett, FLOYD, aviator, born at Warrensburg, N.Y., 1890; died at Quebec, Canada, 1928. At first an automobile mechanic, he became an instructor in aviation mechanics during World War I. He later became a member of the aviation detachment under Richard E. Byrd (*q.v.*) on the Macmillan expedition to Greenland. The following year, he piloted Byrd's plane in the first flight across the North Pole and was made second in command of a proposed flight over the South Pole. His career was cut short, however, by his premature death from pneumonia, contracted while flying to the aid of the crew of the airplane *Bremen,* stranded on Greenly Island, off the coast of Labrador, in the first trans-Atlantic flight westward.

Bennett, HENRY GORDON, soldier, born in Melbourne, Australia, April 15, 1887. He was graduated from Hawthorn Coll., Melbourne, studied military science in the militia reserve, and served (1915-18) in World War I, entering service as a lieutenant colonel. In 1940, as a major general, he commanded the 8th Division, Australian Imperial Force and later headed all Australian forces in Malaya. When Singapore fell to Japan in 1942, he escaped and returned to Australia to become inspector general of training, as a lieutenant general. Later in 1942 he was made commander of the 3rd Australian Corps and served until his retirement at the war's end.

Bennett, JAMES GORDON, journalist and founder of the New York *Herald,* born in Banffshire, Scotland, Sept. 1, 1795; died in New York City, June 1, 1872. Although he first studied for the priesthood, in 1819 he emigrated to America, where he was a public-school teacher. Subsequently he lectured and contributed to various magazines and newspapers. In 1835 he founded the New York *Herald* as a one-cent newspaper and issued it from a cellar basement, where he was proprietor, editor, and salesman. It was the first daily newspaper to publish reports of stock sales, financial reviews, and other features now common to the great daily publications. When steamship lines and telegraph connections were established, he secured correspondents in all countries and made the paper a great commercial success. His editorials were independent in politics, but he generally supported the Democratic party. Bennett continued to edit the paper until his retirement in 1867.

Bennett, JAMES GORDON, JR., editor, capitalist, born in New York City, May 10, 1841; died in Beaulieu, France, May 14, 1918; the son of the founder of the New York *Herald*. Educated chiefly in Europe, he returned to America at the outbreak of war in 1861, entering the Navy as a lieutenant. In 1866 he became managing editor of the *Herald,* succeeding his father as owner and publisher in 1872. In 1867 he founded the *Evening Telegram*. He financed Stanley's expedition to Africa to find Livingston (1869-71) and the *Jeannette* polar expedition (1879-81). The famed Paris edition of the *Herald* was established by him in 1887. With John W. Mackay he organized (1883) the Commercial Cable Company, which broke the Gould monopoly in that field. Sportsman and yachtsman, he lived lavishly, spending some $30,000,000 during his ownership of the *Herald*. From 1877 till his death he resided mostly in France.

Bennett, RICHARD BEDFORD, Canadian statesman, born in Hopewell, N.B., July 3, 1870; died in Surrey, England, June 26, 1947. In 1893 he was admitted to the bar and began his law practice in New Brunswick, but later moved to Calgary. He served in the Alberta legislature (1909-11) and was a member of the House of Commons (1911-17; 1925-39). In 1930 he was elected premier of Canada; he attempted to establish economic reform, but was defeated for re-election in 1935. As leader of the Conservative party (1927-38), he took part in the Imperial Conference (*q.v.*) at Ottawa. Bennett was known as an ardent imperialist and advocate of strong government control.

Bennett, ROBERT RUSSELL, orchestrator, composer, conductor, born in Kansas City, Mo., June 15, 1894. His formal music education was under Carl Busch and Nadia Boulanger. Beginning in 1924, with "Rose Marie," Bennett became a noted orchestrator of musical comedies, including "Show Boat" (1927), "Roberta" (1932), "Kiss Me, Kate" (1948), and "By the Beautiful Sea" (1954). After work in Hollywood, he joined (1940) New York radio station WOR. Among his serious compositions are "Symphony in D for the Dodgers" and a "symphonic picture" of thematic material from George Gershwin's "Porgy and Bess." In 1947 he became president of the National Assn. of American Composers and Conductors. He was the winner of a Guggenheim fellowship for two years. Bennett has written many articles on music.

Ben Nevis (*bĕn nē'vĭs*), a mountain of the Grampians (*q.v.*), in Inverness-shire, northern Scotland. It has the highest peak in the British Isles, reaching 4,406 ft., with a precipice of 1,500 ft. on the northeast side. In 1883 a meteorological observatory was erected on the mountain top.

Bennington (*bĕn'ĭng-tŭn*), county seat of Bennington County, Vermont, located in the southwest portion of the state, 31 m. N.E. of Troy, N.Y., on the Rutland R.R. It is the site of Bennington Coll. for women, founded in 1925. The leading manufactures are textiles, knit goods, paper, furniture, and knitting machinery. The pottery industry (1793-*ca.* 1900) produced many objects now much sought by collectors. Historically, Bennington played a memorable part in the American Revolution, serving as an important supply base for the Continental Army. The Battle of Bennington, commemorated by a monument near the town, took place on Aug. 16, 1777. Here the "Green Mountain Boys," led by Gen. Stark, defeated a detachment of Burgoyne's army, commanded by Col. Baum, resulting in the capture of public stores and of 600 British prisoners. The town of Bennington was settled in 1761 and incorporated in 1849. Population, 1950, 8,002.

Benno (*bĕn'ō*), SAINT, patron saint of Munich and Bavaria, born in Hildesheim, Germany, *ca.* 1010; died in Meissen, June 16, 1106. Educated at Gosslar, he was nominated bishop of Meissen, Germany, in 1066 by Henry IV. Saint Benno was canonized in 1523 by Pope Adrian VI, despite strong opposition on the part of Luther. His remains were deposited in Munich in 1576. June 16 is celebrated as his feast day.

Benôit (*bĕ-nwä'*), PIERRE LEONARD LEOPOLD, composer, born in Harelbeke, Belgium, Aug. 17, 1834; died in Antwerp, March 8, 1901. He received his musical education at the Conservatory in Brussels, and a government grant (1857) made further study in Germany possible. Subsequently he filled musical appointments in Paris. In 1867 he founded the Royal Flemish Conservatory at Antwerp and directed there until 1899. He wrote many volumes on musical subjects, and his numerous compositions include operas, cantatas, motets, songs, and hymns.

Benôit de Sainte-More (*dĕ săn̲t'môr*), or SAINTE-MAURE, troubadour of the 12th century, probably born in Touraine, France. He was the author of the poem, "*La Chronique des ducs de Normandie*" (*ca.* 1180), which recounts the history of the Norman dukes from Rollo to Henry I. His "*Roman de Troie*" (*ca.* 1160), a 30,000-line poem, is the source for the Troilus and Cressida story used by Shakespeare, Chaucer, and Boccaccio.

Benson (*bĕn'sŭn*), EZRA TAFT, U.S. Secretary of Agriculture, born in Whitney, Idaho, Aug. 4, 1899. He was graduated from Brigham Young Univ. (1926) and received (1927) an M.S. degree in agricultural economics from Iowa State Univ. He specialized in agricultural economics and held executive positions with farmers' cooperatives. As Secretary of Agriculture under President Eisenhower, Benson instituted a drastic reorganization of the department and strongly advocated a flexible price program instead of fixed price supports. He is one of the Quorum of Twelve Apostles, the governing body of the Mormon Church.

Bent (*bĕnt*), CHARLES, pioneer, born in Charleston, Va. (now W.Va.), Nov. 11, 1799; died in Taos, N.M., Jan. 19, 1847. His early days were spent as a fur trapper in the Far West. With the help of his brother William, he planned and built Bent's Fort, a trading post near La Junta, Colo., on the Arkansas River. The fort was completed in 1832 and was left to the management of his brother. In 1846 Bent was appointed civil governor of New Mexico. He was killed (1847) during an uprising of Indians and Mexicans at Taos, precipitated by the removal of U.S. troops from that area. Bent was the brother-in-law of the almost legendary Kit Carson.

Bent, WILLIAM, pioneer, brother of Charles Bent (*q.v.*), born in St. Louis, Mo., May 23, 1809; died in Colorado, May 19, 1869. In his early youth he joined Charles in his fur-trapping expeditions and was responsible for the execution of Charles' plans for the building of Fort Bent. After its completion in 1832, the management of the trading post was entrusted to William. He later became the first permanent white settler of Colorado and one of its most prominent citizens.

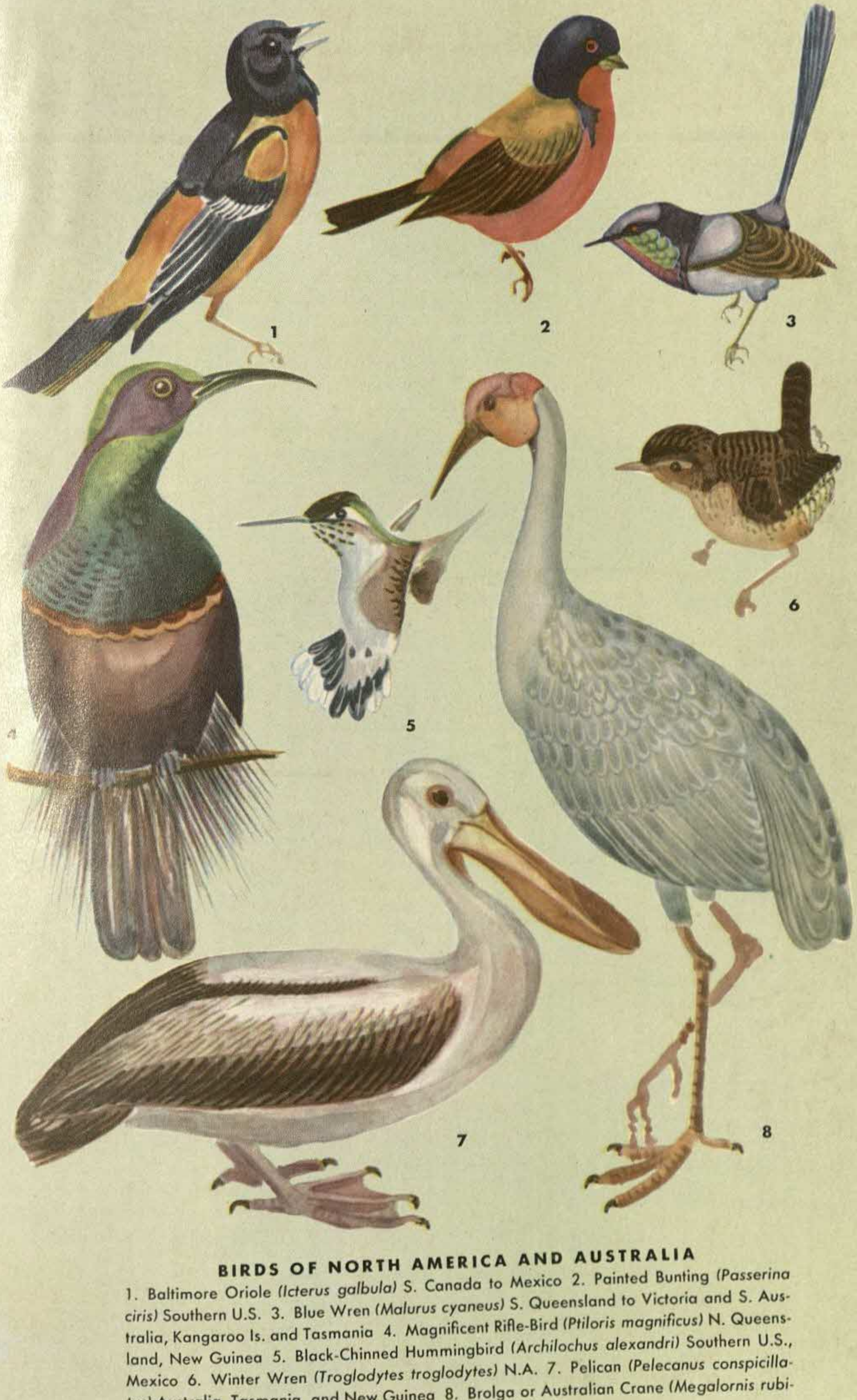
Bent Grass (*bĕnt gräs*), a fine-leaved grass good for golf courses and, when mixed with other kinds of grass, for lawns in the northern U.S. There are three species, colonial, creeping, and velvet bent (*Agrostis tenuis, A. palustris,* and *A. canina*), each of the first two having numerous varieties or strains.

Bentham (*bĕn'thạm*), GEORGE, botanist, born near Portsmouth, England, Sept. 22, 1800; died Sept. 10, 1884. He was a nephew of Jeremy Bentham (*q.v.*), for whom he acted as secretary (1826-32). He studied law at Lincoln's Inn, and during this period he wrote several works on legal subjects. When an inheritance made him independent, however, he devoted his attention to botany. For some time he resided in France, where he catalogued many plants, and, in 1857, he studied the flora of China and Australia. He collaborated with Sir Joseph Hooker in publishing "*Genera Plantarum*" (3 vols.; 1862-83), an exhaustive work on botanical science.

Bentham, JEREMY, jurist and philosopher, born in London, Feb. 15, 1748; died there, June 6, 1832. He was graduated from Queen's Coll., Oxford, in 1763. Called to the bar in 1772, he gave his attention to the theory and philosophy of law rather than to its practice, publishing numerous works on governmental, penal, and legislative reforms. He advocated many social changes, including that of the institution of universal suffrage, which were later generally adopted. He was the first to formulate the idea of utilitarianism (*q.v.*) in ethics. Among his works was "Introduction to the Principles of Morals and Legislation" (1789).

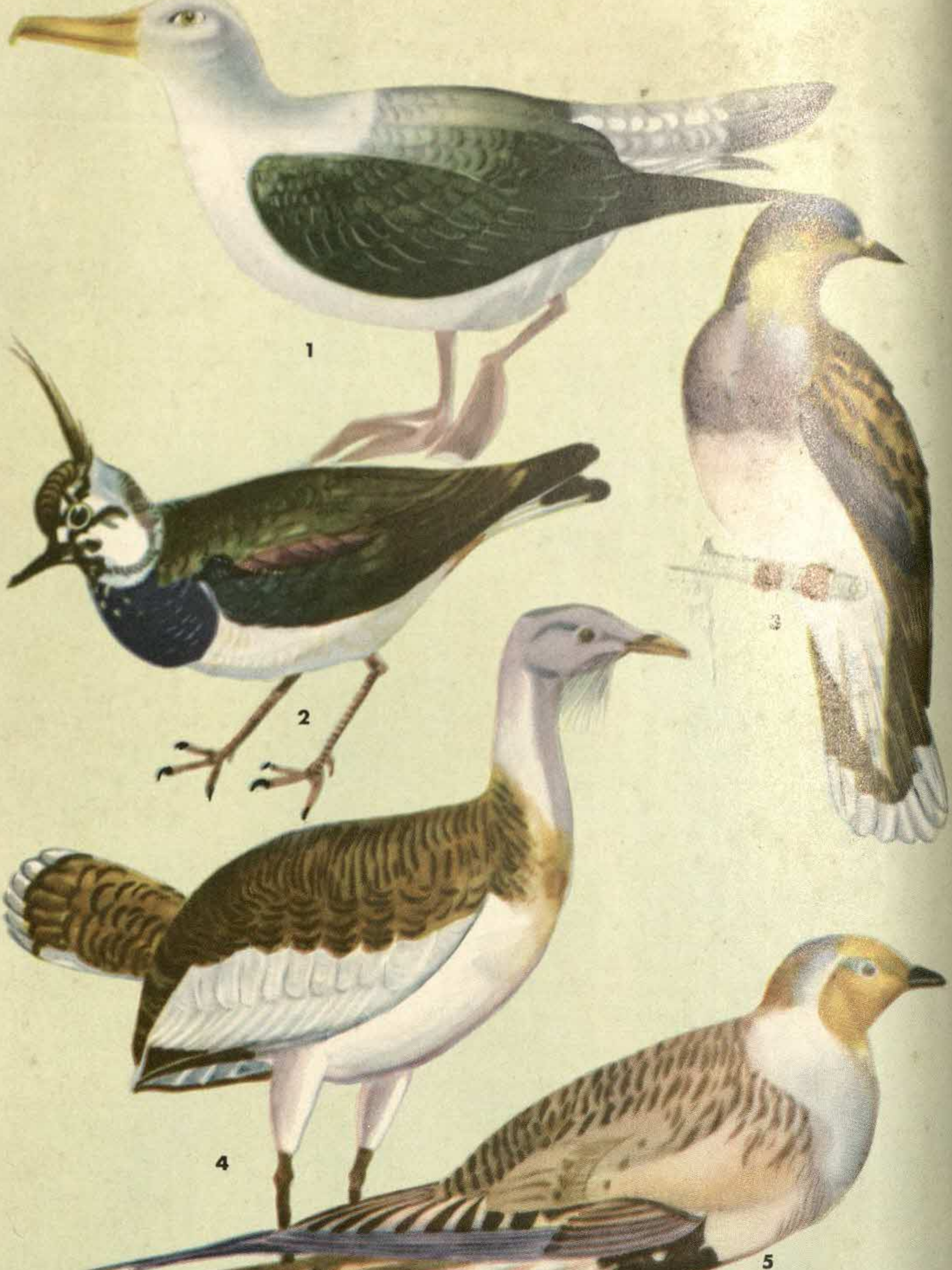
Bentinck (*bĕn'tĭngk*), LORD GEORGE, politician, born in Welbeck Abbey, England, Feb. 27, 1802; died there, Sept. 21, 1848; the son of the 4th Duke of Portland. After service in the army, he became a member of Parliament in 1828. Though he belonged originally to the Whig party, he soon joined the Opposition, with which he remained identified until 1846. As leader of the Protectionist party, he presented strong opposition to Sir Robert Peel (*q.v.*), against whom he held personal as well as political grudges. Previously known only in the sporting world, he now devoted himself to political leadership. Finding himself out of sympathy with many of the Protectionist policies, however, he resigned his leadership at the end of 1847.

Bentinck, LORD WILLIAM CAVENDISH, statesman, born in England, Sept. 14, 1774; died in Paris, France, June 17, 1839; the son of the 3rd Duke of Portland. He served in the army, rising to the rank of lieutenant colonel at Marengo. In



BIRDS OF NORTH AMERICA AND AUSTRALIA

1. Baltimore Oriole *(Icterus galbula)* S. Canada to Mexico 2. Painted Bunting *(Passerina ciris)* Southern U.S. 3. Blue Wren *(Malurus cyaneus)* S. Queensland to Victoria and S. Australia, Kangaroo Is. and Tasmania 4. Magnificent Rifle-Bird *(Ptiloris magnificus)* N. Queensland, New Guinea 5. Black-Chinned Hummingbird *(Archilochus alexandri)* Southern U.S., Mexico 6. Winter Wren *(Troglodytes troglodytes)* N.A. 7. Pelican *(Pelecanus conspicillatus)* Australia, Tasmania, and New Guinea 8. Brolga or Australian Crane *(Megalornis rubicundis)* Australia (except s.w.)



BIRDS OF EUROPE, AFRICA, AND ASIA

1. Black-Browed Albatross *(Diomedea melanophrys)* off Cape Horn, sometimes N. Atlantic 2. Lapwing *(Vanellus vanellus)* Europe, Africa 3. Turtle-Dove *(Streptopelia turtur turtur)* Europe, Africa, and Asia 4. Great Bustard *(Otis tarda tarda)* Europe, S. W. Asia 5. Pallas' Sand-Grouse *(Syrrhaptes paradoxus)* S.E. Russia, W. Europe, W.C. Asia

1803 he was nominated governor of Madras, but because of the Sepoy Mutiny was recalled from that post in 1807. During his administration as governor general of Bengal (1828-33) he effected the suppression of the Thugs (*q.v.*), abolition of suttee, and the establishment of English as the basis of Indian education. He served as first governor general of India (1833-35).

Bentley (*bĕnt′lĭ*), JOHN FRANCIS, ecclesiastical architect, born in Doncaster, England, Jan. 30, 1839; died in London, March 2, 1902. He was a pupil of Henry Clutton, an exponent of the French Gothic school of ecclesiastical architecture and set up his own practice in 1862. In preparing plans for his most important structure, the Roman Catholic cathedral in Westminster, he traveled to Italy and Constantinople in order to study the Byzantine style at its source. In 1898 he was invited to visit the U.S. where he was to build a cathedral in Brooklyn. At the time of his death plans for this cathedral were incomplete.

Bentley, RICHARD, classical scholar and critic, born in Oulton, Yorkshire, England, Jan. 27, 1662; died in Cambridge, July 14, 1742. He was of high standing in the Established Church and a minister of recognized ability. He was graduated (1680) from St. John's Coll., Cambridge. In 1700 he was chosen master of Trinity Coll., Cambridge, from which post he was nearly removed for tyrannical behavior. His reputation is based largely upon his movement in favor of more extensive research in the literature of the Greek Church and the instigation of a new era of criticism. He published "Dissertation on the Epistles of Phalaris" (1697, 1699) and many other works.

Benton (*bĕn′tŭn*), THOMAS HART, statesman, born in Hillsboro, N.C., March 14, 1782; died in Washington, D.C., April 10, 1858. After gaining admission to the bar (1811) and serving in the War of 1812, he edited the *Missouri Enquirer*. Benton was chosen a Senator from Missouri in 1821. When Andrew Jackson became President (1829), Benton, an old and, for a time, estranged, friend, became the President's chief spokesman in the Senate. Outstanding in Benton's political career were his fight against a national bank and his advocacy of hard (as opposed to paper) currency, a stand that earned him the name of "Old Bullion." He also favored measures to promote development of the West, including cheap land, and championed moderation in handling the slavery question, with gradual abolition as a goal. After 30 years in the Senate and one term (1853-55) in the House of Representatives, he was defeated for public office and retired. His autobiography, "Thirty Years View" (1854-56), has been considered outstanding.

Benton, THOMAS HART, painter, born in Neosho, Mo., April 15, 1889. Benton experimented with modernist techniques while an art student in France (1908-13), but returned to America to become one of the outstanding painters of the "American scene," employing a highly formalized but conservative style. He was particularly influential during the 1930's, publishing his autobiography, "An Artist in America" (1937), and painting murals for the Whitney Museum of American Art and the New School for Social Research in New York. In his murals, as in easel paintings like "Threshing Wheat" (1941), Benton treated the life and surroundings of farmers and workers, in a system of arbitrary patterns and uniform surfaces. His emphasis on American subjects was most recently demonstrated in his 1961 mural, "Independence and the Opening of the West," for the Truman Library in Independence, Mo.

Benton Harbor, a city in Michigan, in Berrien County, on Lake Michigan, 48 m. s.w. of Kalamazoo. Located on the New York Central R.R., it is a marketing center for fruit and dairy products from the surrounding agricultural area. Important manufactures include furniture, silk products, automobile parts, and iron products. The religious group popularly called the House of David, brought here in 1903, has its center, called the City of David, located on the edge of Benton Harbor. The city was incorporated in 1891. Population, 1950, 18,769; in 1960, 19,136.

Bentonite (*bĕn′tŏn-īt*), colloidal clay, or WILKINITE, a natural plastic clay (*hydrated aluminum*

Courtesy Metropolitan Museum of Art, N. Y.
JULY HAY. PAINTING BY THOMAS HART BENTON

silicate) which swells greatly when wet. It is found in Canada, Montana, Utah, Wyoming, and California. It is used as a bonding agent for clay in making electrical and chemical porcelain; in pencil leads; in making abrasive wheels; in pottery clays to increase plasticity; as a bonding agent in molding sands; as an emulsifier for oils; and as a plaster base.

Benzedrine (*bĕn′zẹ-drēn*), or AMPHETAMINE, a synthetic organic compound which is very volatile and which when inhaled produces a shrinkage of the nasal mucosa. It is used in inhalers to relieve symptoms of head colds, sinusitis, rhinitis, hay fever, and asthma. *Benzedrine sulfate* (or amphetamine sulfate), is a synthetic organic powder which when taken internally produces a considerable stimulation of the central nervous system and feeling of well-being or increased capacity for mental effort. It is used in the treatment of narcolepsy (abnormal sleepiness when sufficiently rested), and of retarded mental activity in certain depressive states and other psychiatric disorders such as depression and retardation from chronic alcoholism. Against the advice of informed medical authorities, this drug has been widely used to combat fatigue and sleepiness in normal individuals, sometimes leading to overexertion, habituation to the drug, and physical breakdown due to the undesirable side effects of the drug when used indiscriminately.

Benzene (*bĕn′zēn*), or BENZOLE, a mineral fluid obtained from the distillation of coal tar and usually classed with the hydrocarbons. It is secured from a grade of oil that floats on water when coal tar is distilled. At about the freezing point of water it solidifies and forms a mass of crystals. It is a good solvent for fatty substances, hence is much used for cleaning purposes. It burns with a bright flame. Nitrobenzene is formed by mixing benzene with nitric acid. Aniline (*q.v.*) is made from nitrobenzene.

Benzine (*bĕn′zēn*), a liquid obtained from coal tar and petroleum, consisting of hydrocarbon. It is highly inflammable and nearly colorless, and has a peculiar but agreeable odor. It is used in the manufacture of gutta-percha and India rubber on account of its solvent powers. Benzine is also used for removing grease spots from clothing, for cleaning gloves, in the manufacture of paints and varnishes, and as a burning fluid.

Benzoin (*bĕn′zō-ĭn*), or GUM BENJAMIN, a resinous substance obtained from a tree native to Southern Asia and the East Indies. It is fragrant and is used in perfumery and in medicine. The trees that yield benzoin, of which there are several species, are cultivated, and the resin is obtained by making incisions in the bark. The Roman and Greek Catholic Churches use it as incense.

Beowulf (*bā′ō-wo͝olf*), an epic poem of the Anglo-Saxons dating from the 8th or 9th century, the original manuscript of which is in the British Museum. The manuscript is imperfect and many points are obscure, but it is regarded the longest and most important writing in Anglo-Saxon literature. In it the adventures of Beowulf, an Anglo-Saxon hero, are recounted, particularly his defense and delivery of the Danish kingdom from the monster Grendel and his ferocious mother.

Beranger (*bâ-rän-zhā′*), PIERRE JEAN DE, celebrated lyric poet, born in Paris, France, Aug. 19, 1780; died July 17, 1857. His early instruction was given by his grandfather, a tutor, and by his aunt. At the age of 14 he became an apprentice printer, in which capacity he worked for three years. At Paris he aided his father, a Loyalist, in questionable political schemes, but was himself an opponent of that party. Later he became so poor that he lived in a garret, where he devoted himself to the study of literature. At length his wants were so great that he was forced to seek aid. Lucian Bonaparte extended assistance in the form of a pension of 1,000 francs, and five years later secured him a clerkship in the Imperial Univ. In 1815 he published a collection of poems directed against the Bourbons, which made him popular with the masses. This was followed in 1825 by another large collection, and in 1828 still another. Among these were some that met with serious opposition and led to his prosecution. He was accordingly imprisoned for nine months and a fine of 10,000 francs was placed upon him. However, his productions were so popular that many noted literary men came to visit him in prison, among them Dumas, Victor Hugo, and Sainte-Beuve. His last collection of poems was published in 1833. In 1848 his popularity was general, when he was elected to the assembly even against his wishes, with 4,471 votes. His life was full of wisdom and kindness, and his songs are filled with wit and pathos, while through all his writings flows a vein of pleasantry. His memoirs were written by himself, and a treatise on "Social and Political Morality" was undertaken by him with the view of circulating it among the people, but, owing to physical weakness late in life, he was unable to complete it.

Berbers (*bẽr′bẽrz*), the name of a historic people in Northern Africa, found mostly in the mountainous districts of Morocco, Algeria, and Tripoli, and in the northern part of the Sahara Desert. They are of middle stature, possess dark hair and dark, piercing eyes, and are austere in manner and cruel in disposition. Their life is largely pastoral, but they engage to a limited extent in hunting and trading, and in some districts follow agriculture and mining. France and Spain are in possession of the parts of North Africa in which the majority of the Berbers settle. Large numbers live in tribes under independent chiefs.

In early history they were conquered successively by the Phoenicians, Romans, Vandals, and Arabs. The predominating religion is Mohammedanism, and the spoken language is classed with the Hamitic tongues. Their characteristics show that they are a distinct race. Their number is estimated at 5,000,000. Of the many attempts of the Berber tribes to resist European power, the Riffian revolt under Abd-el-Krim caused great losses to France and Spain (1923-26).

Beresford (*bĕr′ĭz-fẽrd*), CHARLES WILLIAM DE LA POER, naval commander, born in Philiptown, Ireland, Feb. 10, 1846. He attended private schools and in 1859 entered the royal navy. In 1868 he was made lieutenant, in 1875 became commander, in 1882 was made captain, and in 1897 rose to the rank of rear admiral. He was aide-de-camp to Queen Victoria in 1897. In the course of his naval experience he served in Asiatic and African campaigns and was four times elected to Parliament. He published "Life of Nelson." He died Sept. 6, 1919.

Berezina (*byĕr-yĕ-zē′nȧ*), a tributary of the Dnieper which rises in the marshes of Borizov (White Russia) extending south for 350 m., of which more than 200 are navigable. Linked with the Düna (*q.v.*), it forms an important waterway, connecting the Black and Baltic Seas. It is the site of a disaster suffered by Napoleon I when his army crossed the river, retreating from Moscow, near Borizov (1812).

Bergamo (*bĕr′gȧ-mō*), a city of Lombardy, in Northern Italy, 28 m. N.E. of Milan. It is an important market and manufacturing center. The city consists of two sections, the upper and the lower, which are connected by a system of street railways. A statue of Garibaldi stands in Garibaldi Place. The public library contains 70,000 volumes. Other buildings include the city hall, the cathedral, and an academy of arts. In early history it was strongly fortified. It was destroyed by Attila in 452 A.D., and later became one of the chief cities of the Lombard kings. Population, *ca.* 65,000.

Bergamot (*bẽr′gȧ-mŏt*), the name of a genus of fruit trees, including several species of pears and citrons. Bergamot oil is made of the citron, or bergamot orange. It is cultivated in Eurasia, and bears a fruit shaped like a pear, yellow in color, which yields a fragrant oil valued as a perfume. This oil is obtained by pressure or by distillation. It is used for flavoring, and in the manufacture of cologne, pomades and essences.

Bergen (*bĕr′gĕn*), a seaport and the second-largest city of Norway, on the Vaagen and the Pudde fjords, constituting the administrative district of Bergen; also the capital of Hordaland County. The chief shipping center of Norway, Bergen is a major industrial and commercial city. Its industries include fishing, shipbuilding, and the processing of food products and of iron and aluminum. It is the seat of Bergen Univ., a marine academy, and business and music schools. Its cultural facilities include museums of natural history, art, and fishery, a meteorological observatory, and a geographical institute. Among historic buildings are Haakon's Hall, a restored 12th-century palace; a 13th-century cathedral; and several ancient churches.

Founded in 1070 as Bjorgvin, Bergen became the capital of the Norwegian kings. In the 13th and 14th centuries German merchants were granted extensive trading privileges, and the city became a center of the Hanseatic League (*q.v.*), whose merchants controlled it until 1560. During World War II Bergen suffered heavy damage in the bombing of German military installations. Population, 1960, 115,845.

Bergerac (*bĕr-zhĕ-rȧk′*), SAVINIEN CYRANO DE. See *Cyrano de Bergerac.*

Bergh (*bûrg*), HENRY, philanthropist, born in New York City, Aug. 29, 1811; died there, March 12, 1888. The son of a prominent shipbuilder, he studied at Columbia Coll. and subsequently spent several years traveling in Europe. In 1864 he returned to the U.S., and two years later he founded, in New York City, the American Society for the Prevention of Cruelty to Animals, the first such organization in the U.S. He was instrumental in obtaining passage of state laws to protect birds and other animals. In 1875, with Elbridge Thomas Gerry, he organized, also in New York City, the Society for the Prevention of Cruelty to Children. Both of these societies later became national in scope.

Bergius (*bĕr′gē-o͞os*), FRIEDRICH, scientist and industrialist, born near Breslau (now Wroclaw), Germany, Oct. 11, 1884; died in Buenos Aires, Argentina, March 30, 1949. Educated in Leipzig, Berlin, and Karlsruhe, Bergius founded a laboratory for chemical research at Hanover. His experiments in the chemical effects of high pressure resulted in a method of liquefying coal, for which he won the Nobel Prize in chemistry, with Carl Bosch (*q.v.*), in 1931. He also succeeded in producing sugar from wood. Applications of his processes were invaluable to the Germans in World War II.

Bergman (*bĕrg′man*), INGRID, motion picture actress, born in Sweden. She attended the Stockholm Lyceum for Girls and studied for one year at the Royal Dramatic Theater School. She first came to the attention of impresarios at the age of 15, appeared for two years on the legitimate stage, for four years on the Swedish screen, and was discovered for the American movie industry by David O. Selznick who brought her to New York in 1940. She made her American debut in a revival of Molnar's "Liliom" and since then has played leading roles in many films, including "Intermezzo," "Adam Had Four Sons," "Rage in Heaven," "Only One Night," "Casablanca," and "For Whom the Bell Tolls." She received (1944) the Academy Award (best actress) for her role in "Gaslight," and the same award for her 1956 role in "Anastasia." In 1946 she appeared on Broadway in Maxwell Anderson's "Joan of Lorraine," a drama concerning Joan of Arc.

Bergman, TORBERN OLAF, chemist, born at Catherinberg, Sweden, Mar. 20, 1735; died July 8, 1784. He studied at the Univ. of Upsala, and became distinguished as a chemist and mathematician. In 1758 he was appointed professor of physics at Upsala, where he taught and lectured a number of years, giving special attention to instruction in chemistry after 1767. He was the first to use the blowpipe successfully, discovered sulphureted hydrogen gas in mineral springs, and laid the foundation of the science of crystallography.

Bergmann (*bĕrg′män*), ERNST VON, German surgeon, born in Riga, Russia, Dec. 16, 1836; died Mar. 25, 1907. He studied in the Univs. of Dorpat, Vienna, and Berlin, and served in the army of Prussia during the wars of 1866 and 1870. In 1871 he was made professor of surgery at the Univ. of Dorpat, where he remained until 1878, when he became professor at Wurzburg. He was appointed professor of surgery at Berlin in 1882. In this institution he remained a long term of years, treating in the meantime many celebrated cases in surgery. He was made a life member of the diet of Prussia in 1906. His works include: "The Theory of Treating Injuries of the Head," "The Putrid Poison," and "The Chirurgical Treatment of Diseases of the Brain."

Bergson (*bĕrg′sŏn*), HENRI LOUIS, philosopher, born in Paris, France, Oct. 18, 1859, of Anglo-Jewish parents; died Jan. 5, 1941. He attended the Lycée Condorcet and was graduated from the famous École Normale Supérieure in 1881. For several years he taught philosophy at the Lycées in Angers, Clermont-Ferrand, and the Lycée Henri IV in Paris. In 1889, he obtained the degree of Docteur-ès-Lettres from the Univ. of Paris, presenting as his doctoral thesis, "Essai sur les données immédiates de la conscience" ("Time and Free Will"). This work, containing the essence of his theories on durational values and the problem of free action, immediately aroused great interest in philosophical circles. Pure duration he conceived as the succession of man's conscious states, time felt rather than measured. Bergson accepted a professorship at the École Normale Supérieure in 1898 and two years later was honored with the chair of modern philosophy at the Coll. de France.

He published "Matter and Memory" (1896), "Laughter" (1900), and "Creative Evolution" (1907). The latter dealt with the whole problem of existence and established Bergson's reputation all over the world. He was elected to the Acad. Française in 1914 and awarded the Nobel Prize for Literature in 1927. Bergson was greatly admired and much sought after in this period, partly because of the marvelous eloquence of his style, but chiefly because his mystic and exceedingly vital philosophy appealed alike to philosophers, politicians, and liberal clergymen. They also welcomed criticisms of mere formalistic and materialistic attitudes which Bergson considered stultifying to creative minds and societies. Bergson was called to lecture at Bologna, Oxford, Birmingham, London, and Columbia Univ. in the years preceding the First World War.

In 1921, he gave up his post at the Coll. de France and devoted himself to politics and international affairs, being particularly active as president of the Committee of Intellectual Co-operation. In this period, he became interested in religious and moral problems, and was converted to Catholicism. It was noted, moreover, that in the case of some other intellectuals of the time, Bergson's philosophy led through a spiritual renaissance to religion and thence to Catholicism. The question of whether Bergson's philosophy was in strict accord with Catholic doctrine is still another problem.

With the exception of "The Two Sources of Morality and Religion," which appeared in 1932, Bergson published nothing during the last 20 years of his life. His books continued to be widely read and exerted a pervading spiritual influence on contemporary philosophical, literary and artistic currents. Marcel Proust, Paul Claudel, Charles Péguy, Albert Thibaudet, Maurice Barrès, Romain Rolland, to a certain degree Paul Valéry and Jean Cocteau, are among the French

HENRI BERGSON

Courtesy Brown Bros., N. Y.

writers who show the influence of Bergsonism. In the U.S. William James was devoted to the work of Bergson. Frequent parallels have been drawn between Bergsonism and the Symbolist theater, even Symbolist poetry, between Bergsonism and impressionistic painting, between Bergsonism and the sculpture of Rodin.

In addition to the above-mentioned works, Bergson contributed papers to the *Revue Philosophique*, the *Revue de Philosophie*, and the *Revue de Metaphysique*, also to the Psychological Inst. and the French Society of Philosophy. He published "La Perception du Changement" (1911), "L'Energie Spirituelle" (1919), and "Durée et Simultanéité" (1922).

In philosophy, Bergson may be associated with the intuitionalist school (see *Intuition*), as opposed to systems based on the intellect; however, he did not adhere to or create any universal system of philosophy. He is esteemed for his subtle and lucid analyses, the originality of his method.

According to Bergson, knowledge derives from intuition. In seeking to understand the nature of life, he rejects the intellect because he considers it limited to spatial values and designed to serve practical needs only. Instinct he rejects also, because it is not an active force in the process of understanding. Thus, he concludes that intuition is requisite for the apprehension of truth. He conceives intuition as "instinct which has become disinterested, self-conscious, capable of reflecting on its object, and of enlarging it indefinitely."

Bergson is primarily concerned with the problem of existence as related to values of duration and movement. For him, the fundamental reality is life, and life he conceives as a constant, vital flow or stream of consciousness. The being itself is both change and movement ("Je suis une chose qui dure"). Real time (not time in the usual sense) is the experience of pure duration, of the pulsing flow of conscious states whose qualities fuse and permeate each other endlessly. Real time is time which is flowing with man's past, present, and future. Qualitative changes which take place in flowing time, in the living stream of life, constitute an evolution which is creative. Every action is the confluence of all our conscious states in a vital urge (*élan vital*) from which springs new creative activity. This is free action. When we act freely, we create. Memory is the supreme moment of heightened consciousness when man feels the possibilities for creative action. Matter is the static deposit of past created actions. As man matures, he accumulates more richly concentrated sources (experiences of conscious states) for the vital urge, which may express itself in a variety of forms—in a creative evolution of man, society, morals, religion, or art.

Berhampur (*bĕr'ŭm-pōōr*), a town of India, in the lieutenant governorship of Bengal, 115 m. N. of Calcutta. It was long a military station of Great Britain. A college, several churches, and the government buildings are among the most important structures. It was the scene of hostilities in the Sepoy mutiny of 1857. Population, *ca.* 25,380.

Beriberi (*bĕr'ĭ-bĕr'ĭ*), or KAKKE, a disease caused by vitamin (*q.v.*) deficiency and probably brought about by a diet chiefly consisting of polished rice. It is a form of neuritis, but is known as kakke in Japan and beriberi in India. The patient becomes numb or paralyzed and sometimes madness and paroxysms occur. Death frequently results from this disease in from 20 to 30 hours, though many cases are protracted or do not prove fatal.

Bering (*bē'ring*), or BEHRING, VITUS, famous navigator, born in Horsens, Denmark, in 1680; died on Bering's Island, Dec. 8, 1741. During the war between Russia and Sweden he displayed great courage and was chosen by Peter the Great to command a voyage of discovery in the vicinity of Kamchatka. In 1728 he explored the coasts of Kamchatka and Okhotsk and the Arctic Ocean north of Siberia. The following year he made surveys of Bering Strait and examined the northwestern coast of North America. He was wrecked on the Island of Awatska, now known as Bering's Island, where he died. Bering Sea and Bering Strait were named in his honor.

Bering Sea, the northern extension of the Pacific Ocean, bounded on the N. by Asia and Bering Strait, E. by Alaska, S. by the Aleutian Islands, and west by Kamchatka. It communicates with Bering Strait, which separates Asia from North America, and connects Bering Sea with the Arctic Ocean. Bering's Island is northwest of the Aleutian chain, off the coast of Kamchatka, and is of no value except as a station for seal fishing. It is not inhabited and possesses no timber. The island has an area of 30 sq. m., and is noted as the burying place of its discoverer, Vitus Bering.

Bering Sea Question, a controversy between the U.S. and Great Britain, which originated after the transfer of Alaska from Russia to the U.S. in 1867. The dispute arose over illegal use of the Bering Sea seal fisheries by the Canadians. An arbitration commission met at Paris, Mar. 23, 1893, to settle the controversy, after receiving a report from experts. The result of the arbitration was that definite boundaries were fixed for the sealers of Canada and the U.S., and proper precaution was taken for the protection of young seals. This adjustment led to a satisfactory conclusion, both on the part of England and the U.S., and the maintenance of the law, whereby the seal fisheries are regulated and the seals protected from extermination.

Bering Strait, the narrow passage of water which connects the Arctic with the Pacific Ocean, separating Asia from America. The distance at the narrowest point, between East Cape in Asia and Cape Prince of Wales in America, is about 54 m. Two small islands lie about midway between. The depth ranges from 150 ft. to 200 ft. It is frozen in winter, and fog prevails most of the time in summer. It was discovered by the Russians in 1648 and later explored by Vitus Bering and Capt. James Cook (*qq.v.*).

Berkeley (*bûrḳ'lĭ*), a city in western California, in Alameda County, 5 m. s. of Oakland, on San Francisco Bay. It is served by the Atchison, Topeka and Santa Fe Ry. and the Southern Pacific R.R. Its industries include the manufacture of soaps, printing inks, scientific instruments, transportation equipment, and pharmaceuticals. The city is part of the San Francisco-Oakland standard metropolitan statistical area and had a value added by manufacture in 1958 of $86,109,000. Noted as an educational center, Berkeley is the seat of the Univ. of California's main campus, Armstrong Coll., and several theological schools. It is also the site of many state and Federal agricultural and conservation agencies. Berkeley was founded in 1853 and incorporated in 1878. The city's decade of greatest growth was 1940-50, when the population increased from 85,547 to 113,805. In 1960 the population was 111,268.

Berkeley, GEORGE, ecclesiastic, born in County Kilkenny, Ireland, March 12, 1685; died in Oxford, England, Jan. 14, 1753. He is known for his theory called Idealism, which explains the phenomena of the universe by referring them to ideas in some form. In 1707 he became fellow of Trinity Coll., Dublin, and he traveled in Europe in 1714 and 1716-20. In 1721 he was appointed chaplain to the Duke of Grafton, the lord lieutenant of Ireland, and in 1724 became Dean of Derry. In 1728 he set sail for Rhode Island with the intention of converting the American Indians to Christianity by the establishment of a college in the Bermuda Islands. For this purpose he expected a government grant of $100,000, but the money never came, and in 1731 he returned to England. In 1734 he became bishop of Cloyne.

His philosophy argues that the world exists only in our thoughts, and that the external objects around us are merely impressions made upon our minds by the action of God. Among Berkeley's works are "Essay Towards a New Theory of Vision" (1709), "A Treatise Concerning the Principles of Human Knowledge" (1710 and 1734), "Three Dialogues between Hylas and Philonous" (1713), "Alciphron" (1732), and "Siris" (1746).

Berkeley, SIR WILLIAM, colonial governor of Virginia, born near London, England, *ca.* 1606; died in Twickenham, July 13, 1677. He was of noble birth, a graduate of Oxford, and an extensive traveler. In 1632 he was granted a commission to a part of Canada by the king, and in 1642 became governor of Virginia. At first his administration was popular, but later he became involved in disputes with Cromwell and was obliged to resign. When Charles II was restored, he reinstated Berkeley as governor. His last administration was very unsuccessful. A dispute with Nathaniel Bacon (*q.v.*) resulted in an insurrection known as Bacon's Rebellion (1676).

Berkman (*bĕrḳ'mạn*), ALEXANDER, anarchist, born in Vilna, Poland (now in Lithuania) *ca.* 1870; died in Nice, France, June 28, 1936. Berkman came to the U.S. *ca.* 1887. For his attempt on the life of Henry Clay Frick, president of the Carnegie Steel Co., during the Homestead, Pa., strike (1892), he served 14 years of a 22-year prison sentence (1892-1906). After his release, he published, with Emma Goldman (*q.v.*), the anarchist magazines *Mother Earth* and *Blast*. In 1917, the two were arrested for obstructing the draft, and in 1919 they were deported to Russia. Disillusioned by the restriction of freedom under the Bolsheviks, he left Russia and moved to France, where he committed suicide in 1936.

Berkshire Festivals of Chamber Music (*bĕrḳ'shĭr*), founded (1918) by Elizabeth Sprague Coolidge (*q.v.*). Formerly held annually at Mrs. Coolidge's summer home in Pittsfield, Mass., the festivals have been presented since 1925 by the Library of Congress at Washington, D.C., under the provisions of the Elizabeth Sprague Coolidge Foundation. A prize of $1,000 is awarded yearly for the best chamber music composition.

Berkshire Hills, the name of a hilly region of Massachusetts, situated in Berkshire County. These highlands are an extension of the Green Mts. of Vermont, and run north and south through the western part of the state. Mount Graylock, the highest peak, is 3,500 ft. and Mt. Everett, *ca.* 2,600 ft.

Berkshire Symphonic Festival, Inc., an annual musical event held at Tanglewood near Stockbridge (*q.v.*).

Berle (*bĕr'lē*), ADOLPH AUGUSTUS, JR., lawyer, born in Boston, Mass., Jan. 29, 1895. Graduated (1916) from the Harvard Law School, he served with the Army intelligence services in World War I and was a U.S. adviser at the Paris Peace Conference (1918-19). He subsequently became a practicing lawyer in New York City. With the election of President Roosevelt in 1932, Berle became a member of the New Deal "Brain Trust." Assistant secretary of state (1938-44), Berle has also been U.S. ambassador to Brazil (1945-46) and professor at Columbia Law School (1946-), where he had previously been a lecturer for many years. Among his writings, "The Modern

Corporation and Private Property" (1932), which he co-authored with Gardner C. Means, has become a standard text.

Berlichingen (*bĕr′lĭk̦-ĭng-ẹn*), GOETZ VON, born in Württemberg, Germany, *ca.* 1480; died at Hornberg Castle, July 23, 1562. The archetype of a German knight, he won fame fighting against the Turks in Hungary during the rule of the German Emperor Charles V. Since he had lost his right hand and had replaced it by an iron device, he was known as "Goetz of the Iron Hand." An active partisan in the German Peasant War, a revolutionary movement of his time, he became tremendously popular. Using his autobiography, first published in 1731, Johann Wolfgang von Goethe (*q.v.*) made him the central figure in his "Goetz von Berlichingen" (1772).

Berlin (*bĕr′lĭn*), a city of Coos County, New Hampshire, on the Androscoggin River, about 20 m. E. of Lancaster. It is on the Boston & Maine and the Grand Trunk R.R.'s. The manufactures are paper, flour, machinery, newsprint, and leather products. It is also a favorite winter resort for skiers. Population, 1930, 20,018; in 1950, 16,615.

Berlin (*bĕr-lĭn′*), a city of Germany. Before World War II it was the second city of Europe and fourth largest city of the world, exceeded in population only by London, New York, and Tokyo. It is located in the same latitude as Edmonton, Alberta, but its climate corresponds to that of New York and Philadelphia. Berlin was the capital of Prussia (1701-1945), the German Empire (1871-1918), the Republic (1918-33), and the Third Reich (1933-45).

DESCRIPTION. Berlin is situated at the mouth of the Spree River, and in the center of what was originally a sandy plain. The region has been improved by fertilization, however, and now produces abundant crops. Since 1948 the city, with an area of 340 sq. m., has been divided into two sectors—West Berlin and East Berlin, the point of division being the Brandenburg Gate, heavily damaged by Allied bombings of World War II. Prior to the war, Berlin was the hub of the North German railroad system and the focal point of canals and waterways connecting it with North Sea and Baltic seaports. The city itself is traversed by subways, buses, and trolleys.

Metropolitan Berlin, one of the busiest traffic centers in Europe before World War II, was then a sprawling city with dingy factory districts, crowded housing areas, bustling commercial sections, and fashionable residential areas. The city's historical monuments and public buildings were almost all severely ruined or completely demolished by constant air attacks during the war. Among these are the former royal castle, an excellent example of 18th-century German baroque and rococo architecture; the Charlottenburg Castle and Castle Monbijou, the Reichstag building (partially destroyed by fire in 1933), and other notable structures. Berlin's main street, *Unter den Linden,* extending for two-thirds of a mile and once flanked by hotels, elaborate office buildings, and embassies, was among the noted thoroughfares of the world.

Associated Press Photos

TWO VIEWS OF BERLIN

Prewar Berlin along the Spree River (*above*) and the postwar Kurfürstendamm (*below*), a fashionable shopping street in West Berlin

EDUCATION. Education is compulsory, the public and private school system being divided into kindergarten, elementary, middle, and high schools. Humboldt Univ. (founded 1810) is situated in the Eastern zone; and the Free Univ. of Berlin, established (during the Russian blockade) with American aid, is located in the Western sector. A number of technical and vocational schools, particularly in the metallurgical, electrotechnical, textile, and garment trades, are prominent.

INDUSTRIES. Despite the almost total annihilation of Berlin's factories during the war years and the Soviet blockade (1948-49), which dealt further blows to the city's economic revival, industrial production has steadily climbed. In 1953, for example, West Berlin's production was twice that of 1950 and had reached 66% of the 1936

Courtesy Ewing Galloway, N.Y

THE BRANDENBURG GATE IN BERLIN

The structure, built in the late 18th century, separates the Eastern and Western Zones of Berlin.

output. Today, iron and steel are the principal industries; manufactures include electrical and optical instruments, furniture, paper, artificial silk, processed food, and motion pictures.

GOVERNMENT. Following the capitulation of Germany to the Allies in 1945, Berlin was governed by the Allied Control Council, commonly known as the *Kommandatura,* and divided into several sectors which were occupied by American, British, French, and Russian units, respectively. In 1948 diplomatic rifts between the Western Allies and the Russians led to the latter's withdrawal from the *Kommandatura* and the Berlin Blockade (*q.v.*), during which the city government split into two sections. The East Berlin government, established by the Soviets on Nov. 30, 1948, and the West Berlin City Council, set up on Dec. 5 of the same year, both claimed jurisdiction over the whole city. Shortly after, the American, British, and French Commandants of Berlin revived the *Kommandatura* on a tripartite basis—but open to Soviet participation.

West Berlin's government is composed of a 200-member house of representatives and an executive body, consisting of the ruling burgomaster, a deputy burgomaster, and not more than 16 senators.

POPULATION. Since the split of Germany into East and West, a crucial population problem has arisen in West Berlin, which has become a point of entry for escapees from the Soviet zone. At the end of 1953, over 600,000 such persons had entered the Western zone. Berlin's population in 1939 was 4,332,242; in 1950 the total was 4,525,998—West Berlin, 3,336,475; East Berlin, 1,189,523.

HISTORY. Berlin's history dates from the 13th century, when it was a tiny fishing village inhabited by Wends. Its gradual growth and prosperity began during the reign of Frederick William, the Great Elector (1620-88), who united the separate duchies of Prussia. His successor, Frederick I, enlarged and beautified the city, making vast physical improvements. The city continued to grow, so that by the end of Frederick II's reign the population exceeded 145,000. With the defeat of Napoleon in 1815, Berlin entered a golden age, becoming a center of art and science and an important seat of commerce. It became the capital of the newly founded empire in 1871 and the focus of political activity. In 1918 it automatically became the capital of the German Republic.

Berlin's recent history is marred by the destruction sustained during the last war. The Battle of Berlin, which ended in the final collapse of the Third Reich, was fought from April 21 to May 2, 1945, when the Russians, after fierce street engagements with the Nazis, forced the surrender. It was during this climactic battle that Adolf Hitler (*q.v.*) supposedly committed suicide in a subterranean bunker.

Berlin has also played host to a number of international meetings—the Berlin Congress of 1878, the Big Three Conference of July 1945, held at nearby Potsdam, and the Berlin Conference (Jan. 25-Feb. 18, 1954), attended by the foreign ministers of the U.S., Britain, France, and the U.S.S.R.

Berlin Blockade (*blŏk-ād′*). In the cold war which developed between Russia and the Western Powers after the end of World War II, Berlin became a crucial spot. After restricting traffic between the Western and Soviet-occupied sectors of the city on April 1, 1948, the Soviet authorities walked out of the Allied Control Council on June 15, and on June 24 stopped all railroad and highway traffic into Berlin from the West. This was the Soviet answer to the adoption of a currency reform in the Western zones of Berlin, a policy carried out when negotiations with the Soviets regarding a uniform German currency broke down. By the end of June, the Soviet blockade, which resulted in a sharp curtailment of food shipments to Western Berlin, had become a complete embargo.

The Western Powers then countered with a huge air freight system developed to maintain the citizens and economic life of Western-occupied Berlin. This system (known as the "airlift" and "Operation Vittles") resulted—by the end of 1948—in the delivery to Berlin of a daily average of 4,000 tons of food and other essential supplies by U.S. Air Force units. British and French air forces were adding another 1,000 tons. The daily tonnage sometimes hit a peak of 8,000.

Various attempts were made to end the blockade and its inherent dangers of East-West hostilities. The Western Powers' ambassadors to Moscow negotiated a compromise with Soviet Premier Stalin in the summer of 1948, but implementation of the agreement was blocked on the administrative level. Attempts at the U.N. to end the deadlock also failed; however, in 1949 private discussions between U.S. delegate to the U.N., Philip C. Jessup, and his Soviet counterpart, Jacob Malik, opened the way for a conference of the foreign ministers of France, Great Britain, Russia, and the U.S., which was held in Paris (May 23-June 20, 1949). The ministers were unable to agree on re-establishing four-power control of divided Germany, and their directive to their military commanders to expand East-West trade and normalize as far as possible the life of the city never became operative; Berlin remained divided economically and administratively. The international conference, however, was considered of importance inasmuch as the foreign ministers had met again for the first time since they had adjourned indefinitely on Dec. 15, 1947, after an unsuccessful meeting held in London.

Berlin Decree, the name for an order by Napoleon I, Nov. 21, 1806, prohibiting British imports and excluding from ports under his control neutral ships which had touched at British harbors. This act was part of his so-called Continental System of economic control.

Berlin, IRVING, composer, popular song writer, born in Molgne, Russia, May 11, 1888. His parents came to America (1892) with six of their eight children and made their home in a crowded tenement on New York's lower East Side. In his teens, he became a "singing waiter" in a Bowery café, where he wrote the words to "Marie from Sunny Italy," his first published song, the royalties from which amounted to 37 cents. Continuing to write lyrics, and eventually to compose, he achieved a success in 1911, with "Alexander's Ragtime Band," which foreshadowed the advent of jazz. In that year, he married Dorothy Goetz. After his wife's death in 1912, he wrote the sweet and haunting "When I Lost You."

Berlin has written more than 750 popular songs, among them "Oh, How I Hate to Get Up in the Morning" (1917), "Girl of My Dreams" (1920), "Because I Love You" (1926), the year in which he married Ellin Mackay, "Say It Isn't So" (1932), "God Bless America" (written 1917, revived 1939), and "White Christmas" (1942). He composed the score for "Yip, Yip, Yaphank" and "This Is the Army," the well-known shows of the World Wars I and II, respectively.

Berlin, TREATY OF, a treaty concluded at Berlin, Germany, July 13, 1878, by the Berlin Congress, made up of representatives from Turkey and the six great powers, at the conclusion of the war between Russia and Turkey. The six great powers were Russia, Germany, England, France, Italy, and Austria. The conference was called at the suggestion of Prince Bismarck. By its terms Greece was enlarged, Britain got Cyprus, Russia took Bessarabia, Bosnia and Herzegovina were brought under Austro-Hungarian influence, Bulgaria's independence was recognized, although she was divided into Rumelia and Bulgaria proper, Persia and Russia got part of Armenia, and the independence of Serbia, Rumania, and Montenegro was recognized.

IRVING BERLIN

In his motion picture, "This is the Army"

Berlin, UNIVERSITY OF, the great national university of Germany, and one of the largest and best-equipped institutions of higher education in the world. It originated in 1807, when Frederick William III called a convention of noted German scholars to consider the establishment of an academy or university. The plan was supported by Wilhelm von Humboldt, a brother of Alexander von Humboldt (*qq.v.*), and he was made first minister of education in 1808 to cooperate with the ministry of the interior in securing support. The palace of Prince Henry and a stipulated annual income were assigned to the foundation in 1809, from which year the present organization may be said to date. It has departments of medicine, theology, philosophy, including the arts and sciences, and jurisprudence, and with it are affiliated several institutions, such as museums, seminaries, and observatories. Admission is granted to students of all nationalities. (See also *German Universities*). Following World War II the institution was included in the Soviet sector of Berlin (*q.v.*). In 1948 a number of faculty members formed a new university (the Free Univ.) in the American sector. The new institution opened with 2,000 former students from the Communist-dominated Berlin Univ.

Berlioz (*bĕr-lê-ôs´*), HECTOR, composer, born at Côte-Saint-André, France, Dec. 11, 1803; died in Paris, Mar. 8, 1869. He was the son of a successful physician, who desired him to study for the medical profession. However, he preferred music, and studied at the Conservatoire of Paris and in Italy. In the latter country he met Mendelssohn and Liszt. On his return to Paris he published many cantatas and symphonies, and in 1854 played extensively in Germany, England, and Russia. In 1856 he was elected a mem-

HECTOR BERLIOZ

ber of the Inst. of France and for some time served as librarian of the Conservatoire. He was a music critic for some 25 years, and his collected criticisms and his *"Mémoires"* (2 vols., 1870) are his major literary works.

Berlioz' most popular compositions are the symphonies *"Symphonie Fantastique"* ("Fantastic Symphony," 1830), "Harold in Italy" (1834), and "Romeo and Juliet" (1839), all notable examples of program music (*q.v.*); the operas "Benvenuto Cellini" (1838), "The Damnation of Faust" (1846), and "The Trojans" (1856-59); his overtures, *e.g.,* "The Roman Carnival" (1844); and the oratorio *"L'Enfance du Christ"* ("The Infant Christ," 1854). Noted for his part in the development of program music, he was an important figure in the romantic movement in music. His use of orchestral color and of massive orchestral and vocal ensembles were unmatched in the 19th century, except by Richard Wagner, whose forerunner he may well be considered.

Berlioz was married twice: in 1833 to the Irish actress Harriet Smithson (1800-54), and in 1854 to the singer Marie Recio (died in 1862).

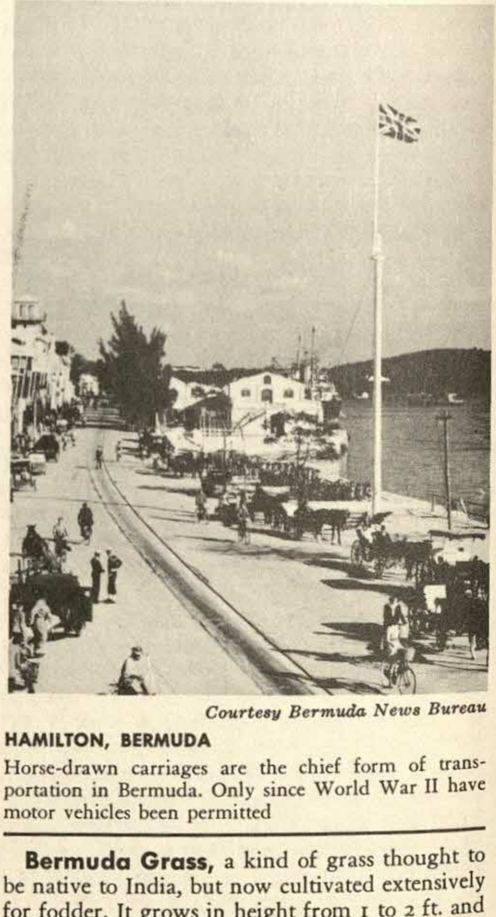
Bermejo (*bĕr-mĕ′hō*). See *Vermejo.*

Bermuda (*bûr-mū′dạ*), an island group, also known as the BERMUDA ISLANDS (formerly the SOMERS ISLANDS). Located in the Atlantic Ocean about 675 m. S.E. of New York, N.Y., the islands number *ca.* 350 but total only a little over 20 sq. m. in land area. They were formed by coral, and they are surrounded by reefs on which are living coral growths. The major island of the group is Bermuda, or Great Bermuda, on which is located the principal city, Hamilton; of the rest, only 19 are inhabited. A British colony, Bermuda is administered by an appointed governor and council and an elected assembly.

The islands' products include bananas, citrus fruits, lily bulbs, and winter vegetables such as potatoes, tomatoes, celery, and the world-famous onions. While imports are three times larger than exports, the unfavorable trade balance is offset by tourists from the U.S. and Canada, who visit Bermuda in large numbers, making it a popular year-round resort.

Education is compulsory between the ages of 7 and 13. There are no government schools, but aid is given in the form of grants.

Bermuda was first discovered by Juan Bermudez, a Spaniard, in 1503, and rediscovered by Sir George Somers, an Englishman, in 1609. During World War II Bermuda leased land to the U.S. for defense bases. Hamilton, the capital, has a population of *ca.* 3,000. Total resident population is over 40,000.



Courtesy Bermuda News Bureau

HAMILTON, BERMUDA

Horse-drawn carriages are the chief form of transportation in Bermuda. Only since World War II have motor vehicles been permitted

Bermuda Grass, a kind of grass thought to be native to India, but now cultivated extensively for fodder. It grows in height from 1 to 2 ft. and roots at the joints. In many regions it is esteemed as a lawn grass, as it remains green until late in autumn. It thrives in either dry or wet places, though it is killed by standing in water.

Bern (*bûrn*) or BERNE, the seat of government of a canton of the same name and the capital of the republic of Switzerland. It is located on the Aar River 1,781 ft. above sea level, and it is *ca.* 60 m. S.W. of Zurich. The city is an important railroad center, and it produces electrical equipment, textiles, machinery, pianos, and chocolate. The old part of Bern, with its towers, arcades, and fountains, has retained its medieval appearance. The city's landmarks include the medieval clock tower; the Minster (cathedral) of St. Vincent, begun in 1421, and the town hall (*ca.* 1410), both outstanding examples of Gothic architecture; and the Federal Palace, built in the late 19th century. Among other points of interest are the bear pits, in which bears have been kept since the 15th century. The Univ. of Bern (1834) is located in the city, as are the Swiss National Library and several museums. Bern is the seat of bureaus of the Universal Postal Union, International Telecommunication Union, and the International Copyright Union. The city was founded in 1191 by Berchtold V of Zähringen and was made a free city in 1218. Bern joined the Swiss Confederation in 1353, becoming its capital in 1848. The Bernese are predominantly Protestant and German-speaking. Population, 1954, of the canton, 833,700; of the city, 154,500.

Bernadette of Lourdes (*bĕr-nạ-dĕt′ ŭv lo͝ord*), SAINT, born BERNADETTE SOUBIROUS in Lourdes, France, Jan. 7, 1844; died in Nevers, April 16, 1879. The daughter of illiterate peasants, she was gathering firewood at a grotto called Massabielle near Lourdes when the Virgin Mary appeared (1858) to her and instructed her to pick up some earth. The apparition told her to ask the authorities to build a church on the site. After much controversy over her claims that the waters had received healing powers from the Virgin, the shrine (later the Basilica of Our Lady of Lourdes) was built and dedicated in 1876. Many thousands have made pilgrimages to Lourdes (*q.v.*), and miraculous cures have been reported. In 1866 Bernadette joined the Sisters of Charity and Christian Instruction at Nevers and in 1878 became a nun (Sister Marie Bernard). She was beatified in 1925 and declared a saint in 1933. Her feast day is April 16. She is the central figure in Franz Werfel's novel "Song of Bernadette" (1942).

Bernadotte (*bûr′nạ-dŏt*), COUNT FOLKE (in full, COUNT FOLKE BERNADOTTE OF WISBORG), born in Stockholm, Sweden, Jan. 2, 1895; died in Jerusalem, Palestine, Sept. 17, 1948. The grandson of King Oscar II of Sweden, he attended the Swedish officers' military school of Karlberg and the military riding school. In 1928 he married Estelle Manville, an American heiress. He represented Sweden at the Chicago Century of Progress Exposition in 1933 and at the New York World's Fair in 1939-40. During World War II, he worked intensively with the Swedish Red Cross and was appointed its head in 1946. While in Germany at the request of Heinrich Himmler (*q.v.*) to arrange a surrender offer subsequently rejected by the Allies, Bernadotte was successful in releasing about 15,000 Scandinavians from Nazi internment camps.

When Israel (*q.v.*) became independent and was attacked by various Arab states (see *Arab League*), Bernadotte was named (May 20, 1948) by the U.N. to mediate. He was in the process of working out a compromise when he was killed by Jewish extremists. "Instead of Arms," his autobiography, was published in 1949.

Bernadotte, JEAN BAPTISTE JULES, later King Charles XIV of Sweden and Norway, born in Pau, France, Jan. 26, 1763; died in Stockholm, Sweden, March 8, 1844. He enlisted in the French army in 1780, becoming minister of war in 1798. He distinguished himself at Austerlitz (1805), which led to his ennoblement as prince of Pontecorvo. The Swedish diet elected him crown prince in 1810, and he was adopted by King Charles XIII of Sweden, under the name of Charles John. When the French army invaded Sweden in 1812, Bernadotte resisted and, in the Battle of Leipzig (Battle of the Nations), rendered effectual aid to the allied forces. In 1814 he required Denmark to cede Norway to Sweden (the two countries remained united under one crown until 1905). He was crowned King Charles XIV of Sweden and Norway in 1818. His 26-year reign was a peaceful one, and the material and industrial development of his united countries during the first half of the 19th century was due mainly to his energetic planning. At his death his only son, Oscar I, succeeded him.

JEAN BAPTISTE BERNADOTTE AND HIS WIFE

Bernardin de Saint-Pierre (*bĕrn-när-dăn̲′ dē săn̲-pyâr′*). See *Saint-Pierre, Jacques Henri Bernardin de.*

Bernard of Clairvaux (*bĕr-närd′ ŭv k̲lĕr-vō′*), SAINT, born near Dijon, France, 1090 (?); died in Clairvaux, Aug. 20, 1153. He became a monk at Citeaux in 1113, and two years later he founded a monastery in Clairvaux, of which he became the first abbot. He later founded so many other monasteries that he is called the second founder of the Cistercian order (see *Cistercians*). He also helped in gaining papal recognition of the Order of Knights Templars. Bernard successfully defended the claims of Pope Innocent II against the antipope Anacletus II. He preached the Second Crusade, persuading both King Louis VII of France and Emperor Conrad III to join. He opposed Abelard (*q.v.*), whose condemnation by the Synod of Paris he approved. Bernard left numerous letters, treatises, sermons, and hymns, of which *"De Consideratione"* (On Consideration), a treatise, is considered his masterpiece. Bernard was canonized in 1174. His feast day is Aug. 20.

Bernhardt (*bĕrn′härt*), SARAH, originally ROSINE BERNARD, actress, born in Paris, France, Oct. 22, 1844, died there, March 26, 1923. She began her theatrical training at the age of 13 and made an unspectacular debut at the Comédie-Française in 1862. Bernhardt was in the company at the Odéon in 1869; after the interruption of the Franco-Prussian War, she played at the Comédie-Française in 1872-80. Following her early successes as *Zanetto* in Coppée's *"Le Passant," Cordelia* in "King Lear," and *the queen* in Hugo's *"Ruy Blas,"* she was acclaimed for performances in Racine's "Phèdre," Sardou's *"La Tosca,"* the younger Alexandre Dumas's *"La Dame aux camélias,"* and Rostand's *"L'Aiglon."* Her success was international. She visited North and South America and many of the large cities of Europe; her first American tour was in 1880 and the last in 1918. In 1915 one of her legs was amputated, but she continued to perform. Considered one of the greatest actresses of all times, "the Divine Sarah" was also an accomplished painter and sculptress.

Bernini (*bâr-nē′nē*), GIOVANNI LORENZO, sculptor and architect, born in Naples, Italy, Dec. 7, 1598; died in Rome, Nov. 28, 1680. He was one of the greatest exponents of baroque (*q.v.*) art, and his ideas were widely followed and imitated in sculpture and architecture. A protégé of Urban VIII and a number of succeeding popes, he designed the forecourt and colonnades adorning the piazza in front of St. Peter's, in Rome, as well as the high altar in the nave of the church. "Apollo and Daphne" (in the Villa Borghese, Rome) and "St. Theresa in Ecstasy" (in St. Maria Della Vittoria, Rome) are among the finest examples of Bernini's baroque style.

SARAH BERNHARDT

Bernstein (*bĕrn-stĕn′*), HENRY LÉON GUSTAVE CHARLES, dramatist, born in Paris, France, June 20, 1876; died there, Nov. 27, 1953. Educated in Paris and at Cambridge Univ., England, Bernstein became a prolific and successful writer of plays in the realistic fashion, concerned with interpersonal relationships and strong emotional situations, occasionally marked by violence and cynicism. His first play, *"Le Marché,"* was produced in Paris in 1900, and his last, "Evangeline," in 1952. Among the best known of his plays to be presented on Broadway (in English) were "Brother Jacques" (1904), "The Thief" (1907), "Melo" (1931), and "Promise" (1936). He lived in the U.S. from 1940 to 1946.

Bernstein (*bĕrn′stīn*), LEONARD, conductor, composer, pianist, born in Lawrence, Mass., Aug. 25, 1918. He was graduated from Harvard Univ. in 1939, studied conducting under Fritz Reiner and Serge Koussevitsky (*qq.v.*), and became the latter's assistant in 1942. He was assistant conductor of the New York Philharmonic-Symphony (1943-44), and it was in this post that he achieved fame in a single performance (Nov. 14, 1943), when he substituted for Bruno Walter (*q.v.*) as conductor. He directed (1945-48) the New York City Symphony, conducted concerts throughout the U.S. and Europe, and later lectured on the "Omnibus" television program. In 1957 he was appointed musical director of the New York Philharmonic Orchestra. Showing great versatility and musical intensity, he has written numerous compositions, including "Symphony No. 1 (Jeremiah)" (1942); "Trouble in Tahiti" (1952), a one-act opera for which he wrote the libretto and music; and the scores for the musicals "On the Town" (1944) and "West Side Story" (1957).

Bernstorff (*bĕrn′stôrf*), COUNT JOHANN HEINRICH, VON, diplomatist, born in London, England, Nov. 14, 1862; died in Geneva, Switzerland, Oct. 6, 1939. His father, Count Albrecht von Bernstorff (1809-73), was for many years ambassador at London. The son served in the army and in 1889 entered the diplomatic service. In 1908 he was made ambassador to the U.S. The outbreak of World War I (1914) made his position very delicate, but he worked tirelessly for peace until his recall (1917). A member of the Reichstag (1920-28), he was active in disarmament negotiations. He went into exile when Adolf Hitler rose to power.

Berry (*bĕr′rȳ*), a small, fleshy and juicy fruit which does not open when ripe. It contains a pulpy mass in which the seeds are immersed. Some varieties are one celled, but others contain compartments united at the axis and from the axis to the rind. Examples are gooseberries, currants, grapes, and belladonna. The term is applied to strawberries, which bear seeds on a pulpy receptacle.

Berry, EDWARD WILBUR, paleontologist, born in Newark, N.J., Feb. 10, 1875; died in Stonington, Conn., Sept. 20, 1945. His formal education ended with high school, and his first job was in commerce. In 1897 he became president and manager of the Passaic (N.J.) *Daily News*. During this period he took up geology as an avocation, working first for himself and later for the New Jersey Geological Survey. He joined, successively, the Maryland Geological Survey at Johns Hopkins Univ. (1905), the department of geology at Johns Hopkins (1906), and the U.S. Geological Survey (1910). He was made assistant state geologist of Maryland in 1917 and in the same year became professor of paleontology at Johns Hopkins. From 1929 to his retirement in 1942, he was dean of the university's college of arts and sciences. Among his writings are more than 500 papers on paleontology, biology, and geology.

Bertillon (*bĕr-tē-yôn̲′*), ALPHONSE, anthropologist, born in Paris, France, April 22, 1853; died there, Feb. 13, 1914. Chief of the department of identification of the Paris police prefecture, he devised a method of identifying criminals, known as the Bertillon system, which was adopted by most countries. The system depends on measurements of the various parts of the body and sometimes supplements fingerprinting (*q.v.*). In 1894 Bertillon was a handwriting witness in the Dreyfus case (see *Dreyfus, Alfred*).

Berwyn (*bĕr′wĭn*), a city in Cook County, Illinois, *ca.* 9 m. west of Chicago's Loop. A residential suburb, it is served by the Illinois Central and the Chicago, Burlington & Quincy R.R.'s. The majority of the population is of Bohemian descent. The city was incorporated in 1908. Population, 1940, 48,451; 1950, 51,280.

Beryl (*bĕr′ĭl*), a mineral containing beryllium and aluminum in silicate form. Its transparent varieties are called precious beryl. Beryl occurs in colorless form and in pale shades of blue, green, pink, and yellow. The most valuable variety is the emerald (*q.v.*); others include the aquamarine, morganite, and euclase.

Beryllium (*bẹ-rĭl′ĭ-ŭm*) or GLUCINUM, a chemical element (symbol: Be; atomic weight: 9.02; specific gravity: 1.816), one of the lightest of metals. Lighter and harder than aluminum and magnesium, it is similar to them in chemical properties. It is derived chiefly from beryl (*q.v.*). Beryllium can be produced from the oxide by electrolytic reduction or by electrolysis of molten beryllium fluoride. In its alloys, particularly with copper, it has specialized uses in the manufacture of aircraft parts and precision instruments. Experimentally, it has been used for the production of neutrons for atom smashing.

Berzelius (*bĕr-zē′lĭ-ŭs*), JÖNS JACOB, BARON, chemist, born in Väfoersunda, East Gothland, Sweden, Aug. 20, 1779; died in Stockholm, Aug. 7, 1848. He studied medicine and chemistry at the Univ. of Upsala and in 1807 began his career as a teacher in medicine and, later, in chemistry. He was chosen a member of the Acad. of Sciences in 1808 and in 1818 was made perpetual secretary. The system of chemical symbols now in general use was originated by Berzelius. He contributed to the knowledge of the atom; he also proposed classification of minerals according to their chemical composition. His wide research included the discovery of the elements selenium, thorium, and cerium.

Besançon (*bē-zän̲-sôn̲′*), a city in France, nearly surrounded by the Doubs River, capital of the department of Doubs, 47 m. E. of Dijon. It is a picturesque town and, because of its medicinal water, is frequented as a spa. The site of the national school of clockmaking, it has been considered the center of the French watchmaking industry. Its chief importance, however, lies in its historic sites. There are Roman remains, St. Jean Cathedral (built from the 11th through the 18th centuries), and many structures from the 16th century. One of the main tourist attractions is Brégille Heights (1,394 ft.), which is accessible by cable car. Known first as Vesontio, the city was founded by the Gauls. Frederick I made it a free city in 1184, and it remained free, with interruptions, until the 17th century. Its university, founded elsewhere, was established here in the late 17th century. Besançon is the birthplace of Victor Hugo and Pierre Joseph Proudhon. Population, 1954, 73,445.

Besant (*bê-zănt′*), SIR WALTER, novelist, born in Portsmouth, England, Aug. 14, 1836; died in Hampstead, June 9, 1901. He was the son of a merchant, attended King's Coll., and subsequently was graduated from Cambridge Univ. He was a professor at the Royal Coll. of Mauritius (in the Indian Ocean) from 1861 to 1867. In 1884 he helped to establish the Society of Authors, of which he was chairman until 1892. His interest in the plight of the poor of London led him to write "All Sorts and Conditions of Men" (1882), a novel which was largely responsible for the establishment of the People's Palace for social reform. For his work in this field, Besant was knighted in 1895. He also wrote or edited a series of historical works on London.

Bessarabia (*bĕs-ạ-rä′bĭ-ạ*), a region *ca.* 17,000 sq. m. in area, lying between Rumania and the Ukraine, divided politically between the Moldavian and Ukrainian S.S.R.'s. It consists of level steppes, except in the northwest, where rise timbered ranges of the Carpathian Mts. The soil is extremely fertile and the agriculture includes cereals, tobacco, and fruits. Livestock, including sheep, are raised.

Bessarabia has been occupied by invaders of many countries during its history. It was held by the Turks from the 16th century until the end of the Russo-Turkish war (1806-12), when the peace of Bucharest ceded it to Russia. The treaty of Paris (1856) returned the southern part to Moldavia, but it was again given to Russia in 1878. After World War I, it was annexed by Rumania, but in 1940 she complied with Russia's demand for its return. As a partner of the Axis powers in World War II, Rumania conquered the region with German help, but it was recovered by Russian forces in 1944 and was formally given to Russia by the terms of the Rumanian peace treaty in 1947. The principal city is Kishinev (pop., *ca.* 190,000), capital of the Moldavian S.S.R. Population, *ca.* 3,200,000.

Bessborough (*bĕz′brŭ*), EARL, VERE BRABAZON PONSONBY, lawyer and statesman, born in England, Oct. 27, 1880; died in Hampshire, March 10, 1956. He was admitted to the bar in 1903. By succession (1920) to his father's Irish earldom, he was 9th Earl of Bessborough; he was created 1st Earl Bessborough (in the British peerage) in 1937. A member of Parliament, Ponsonby served in France and in the Gallipoli campaign in World War I. He was governor general of Canada in 1931-35.

Bessemer (*bĕs′ẹ-mĕr*), a city in Jefferson County, Alabama, 10 m. s.w. of Birmingham, on the Southern, the Louisville & Nashville, and other railroads. It is the center of an iron-producing region, and steel production is the principal industry. In addition, chemical products, machinery, clothing, and bricks are manufactured. The city, named for Henry Bessemer (*q.v.*), was founded in 1887 and incorporated in 1888. Population, 1940, 22,826; 1950, 28,445.

Bessemer, SIR HENRY, engineer and inventor, born in Charlton, Hertfordshire, England, Jan. 19, 1813; died in London, March 15, 1898. With little formal education, Bessemer became one of the foremost inventors of his day. His greatest fame rests on his development of the Bessemer process for manufacturing steel (*q.v.*). His interest in steel grew out of his experiments in gun manufacture. The process, simply stated, involves purification of iron (*q.v.*) by forcing out the carbon content with a blast of air. It revolutionized the manufacture of steel and brought Bessemer a fortune. The process was patented in the U.S. in 1857, but Bessemer's right to the patent was challenged by William Kelly (1811-88). The dispute was resolved by consolidation of the rival processes, the Bessemer name being retained. Among his other inventions is a process for making bronze powder. Bessemer was knighted and made a fellow of the Royal Society in 1879.

HENRY BESSEMER

Bessenyei (*bĕ′shĕ-nyĕ-ĭ*), GYÖRGY, playwright and poet, born in Hungary in 1747; died in 1811. As a young man he became a member of the guard at the imperial court in Vienna, and there he met and was strongly influenced by Voltaire and the Encyclopedists. Bessenyei's works are important only for his use of the Hungarian language, which had fallen into disfavor among the nation's writers. His example is credited with encouraging a return to the use of the native language. Bessenyei is best known for "The Philosopher" (1777), a comedy; his nondramatic writings include biographies and historical works.

Bessey (*bĕs′ĭ*), CHARLES EDWIN, educator and botanist, born in Milton, Ohio, May 21, 1845; died in Lincoln, Nebr., Feb. 25, 1915. From 1870 to 1884 he taught botany at the Iowa Agricultural Coll., with two intervals (1872-73 and 1875-76) of study with Asa Gray (*q.v.*) at Harvard. Bessey was appointed (1884) professor of botany at the Univ. of Nebraska, where he later became chancellor. His most important contribution to the teaching of botany was the development of simple laboratory techniques. He also wrote a number of textbooks and many scientific papers. In 1910 he was elected president of the American Assn. for the Advancement of Science.

Best (*bĕst*), CHARLES HERBERT, physiologist, born in West Pembroke, Maine, Feb. 27, 1899. A graduate of the Univ. of Toronto, Ontario, Canada, in 1921, Dr. Best later became professor of physiology and research associate in the Banting-Best Dept. of Medicine Research at Toronto Univ., of which he became director in 1941. In 1929 he was made head of the university's department of physiology. With Dr. Frederick G. Banting (*q.v.*), he was the discoverer of insulin (*q.v.*) in 1921.

Bestiary (*bĕs'tĭ-ĕrĭ*), a type of book popular during medieval times. It was a combination of fable and natural history that professed to describe the animals of the world and used them to exemplify human characteristics and to draw a moral. Bestiaries were written in most of the languages of Europe, and their fantastic descriptions were widely used as source material by artists and writers. Some of the imaginary characteristics attributed to animals are still in use, *e.g.*, the crocodile's tears.

Beta (*bā'tạ*), β, second letter of the Greek alphabet corresponding to our B.

Beta Rays (*bā'tạ rāz*), high-speed electrons emitted from certain atoms such as Radium B. Beta rays carry a negative electrical charge and may be deflected in electric and magnetic fields. It was first thought that all beta rays come from the nucleus, but later research proved that some of them are due to ejection from circumnuclear electrons. In most cases, these beta rays consist of photoelectrons produced by gamma rays. According to their origin, there are primary and secondary beta rays. A primary beta ray is emitted for each nucleus transformed. This transformation is due to interaction between the nucleus and certain electrons, resulting in the lowering of the energy level of the nucleus, and hence the emission of a beta ray. The speed of these particles has been found to be as high as 180,000 m. per sec., which is about 99 per cent of the velocity of light. The emission of a beta particle from an atom increases its nuclear charge by one unit and transforms the atom into the next higher element in the Periodic Table. Beta rays were discovered by Ernest Rutherford (1871-1937), a British scientist who later became Lord Rutherford of Nelson.

Betatron (*bā'tạ-trŏn*). See *Accelerators; Atom.*

Betel (*bē't'l*) or BETLE, the name of a narcotic stimulant derived from a certain species of pepper. In commercial usage, it is known as betel pepper or as betel nut, depending upon the form in which it is sold. The betel nut used as a stimulant in Asia is made by slicing the nut of *areca palm,* flavoring it with a little quicklime, and wrapping it with the leaf of the betel pepper. It has aromatic and astringent properties. The plant, of which there are several species, is cultivated extensively. The fruit of the areca palm, about the size of a cherry, is marketed in Ceylon and southern Asia.

Betelgeuse (*bĕt'l-jo͞oz*), first-magnitude red star in Orion. It is a "giant" star, larger than the earth's orbit. The distance from the earth is *ca.* 270 light-years.

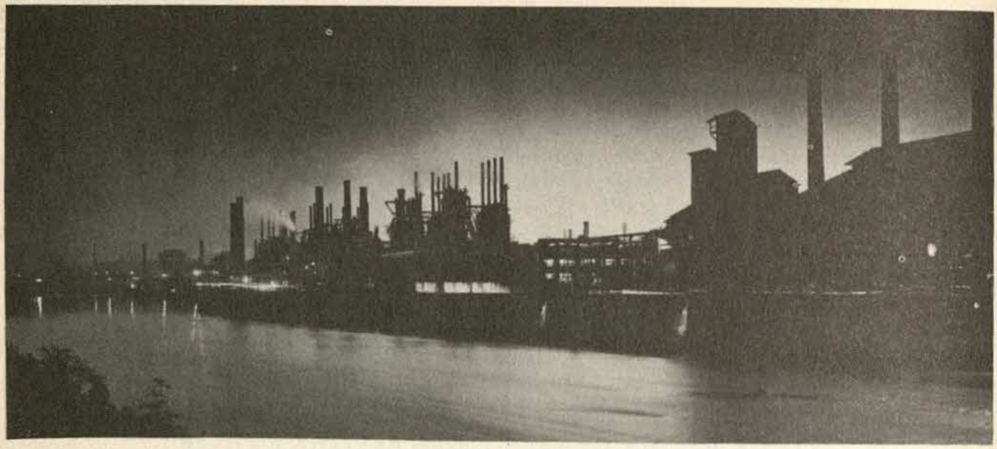
Bethany (*bĕth'ạ-nĭ*), a village (now El-Azariyeh) on the eastern slope of the Mt. of Olives about 2 m. E. of Jerusalem, Palestine, containing at present about 400 inhabitants. It was the home of Mary, Martha, and Lazarus (John 11:1), where Christ often visited and worked many of his greatest miracles. It was near Bethany that Christ's ascension took place (Luke 24:50). Travelers are shown the site of Lazarus' home and the cave in which he was buried.

Bethe (*bāt'ẹ*), HANS ALBRECHT, physicist, born in Strasbourg, Alsace-Lorraine, July 2, 1906. He was educated at the universities of Frankfort on the Main and Munich. He later taught in Germany and England and in 1935 accepted a professorship of physics at Cornell Univ. He was director of the theoretical physics division of the atomic bomb project at Los Alamos (*q.v.*), 1943-46. Bethe was made a member of the President's Science Advisory Committee in 1956 and head of a study on disarmament for President Eisenhower in 1958. He is also the author of several works in his field.

Bethel (*bĕth'ẹl*), in Hebrew, the "house of the Lord"; in the Old Testament the name of a place located 11 m. N. of Jerusalem. Here, according to the Bible, Jacob had his dream envisioning a ladder leading toward Heaven (Genesis 28:10-19). Abraham settled at this place (Genesis 13:3).

Bethesda (*bê-thĕz'dạ*), in Hebrew, the "house of mercy" or "place of the flowing water"; a pool near St. Stephen's Gate and the Temple of Omar in Jerusalem. It is associated with the performance of miraculous cures. It is often identified with the modern Birket Israil, a lake north of the temple area. See John 5:2-9.

Bethesda, an unincorporated community in central Maryland and a residential suburb of Washington, D.C. Bethesda is served by the Baltimore & Ohio R.R. (freight). It is noted as the site of the National Institutes of Health and of the Naval Medical Center. The site of Bethesda was first settled in 1820. Population, 1950, 45,807; in 1960, 56,527.



Courtesy Bethlehem Chamber of Commerce

BETHLEHEM, PA.

Night view of a steel plant in operation

Beth-horon (*bĕth-hōr′ŏn*), in Hebrew, the "place of the hollow"; in the Old Testament, the name of two towns (identified as upper and lower) in Palestine, *ca.* 12 m. N.W. of Jerusalem. The area was the scene of Joshua's victorious battle with the kings of the Amorites (Joshua 10:11) and of a victory of Judas Maccabaeus in the 2nd century B.C. (Maccabees 3:13-24). The modern names of the towns are Beit 'Ur el-Fokha and Beit 'Ur el-Tahta.

Bethlehem (*bĕth′lē-hĕm*), a city in eastern Pennsylvania, 56 m. N. of Philadelphia. The city covers an area of 18.6 sq. m. It lies on both sides of the Lehigh River and is linked by bridges. It is served by the Lehigh Valley, the Reading, and the Central of New Jersey R.R.'s. The Allentown-Bethlehem-Easton airport is *ca.* 3.75 m. from the center of the city. The outlying areas are predominantly agricultural.

Steel manufacturing is the principal industry. The city is the home of the Bethlehem Steel Corp., and there are many steel furnaces and fabricating plants. Other manufactures include textiles, electrical equipment, food products, chemicals, and furniture. Cement-producing areas are nearby. Bethlehem (value added by manufacture, 1958, $210,054,000) forms a standard metropolitan statistical area (pop., 1960, 492,168; value added, 1958, $683,803,000) with Allentown and Easton, Pa., and Warren County, in New Jersey.

The city's *ca.* 30 public elementary and secondary schools enroll *ca.* 11,500 pupils. Its institutions of higher learning include Lehigh Univ., Moravian Theological Sem., Moravian Sem. (for girls), and Moravian Coll. Bethlehem is governed by a commission, composed of a mayor and four councilmen.

Bethlehem was settled in 1741 by Moravians (see *Moravian Brethren*) under the leadership of David Nitschmann. Count Nicholas Zinzendorf (*q.v.*) visited the settlement at Christmas of that year, and the name of Bethlehem was chosen. With the growth of the steel industry in the late 19th century, the town grew rapidly and attracted many immigrants from Europe. In 1917 South Bethlehem, a separate borough, united with West and North Bethlehem to form the present city. The famous Bach Choir, composed of local residents, holds two music festivals each spring. Among points of interest are the main group of Moravian buildings, including the Bethlehem Hotel (1741), the Bell House (1745-46), the Widow's House (1765), and the Central Moravian Church (1803-06). The Protestant Episcopal Cathedral Church of the Nativity is also located in the city.

In 1890 the population of Bethlehem was 6,762; in 1910, 12,837; in 1920, 50,358 (due to the amalgamation of the three boroughs in 1917); in 1950, 66,340; and in 1960, 75,408.

Bethlehem, in Hebrew, the "house of bread," a small town in Palestine, 6 m. S. of Jerusalem, the birthplace of Jesus (Matthew 2:1, 5, 6; Luke 2:4, 7; John 7:42). It is the site of the Church of the Nativity, originally the Church of St. Mary, built by Constantine I and enlarged by Justinian I. Under a richly adorned grotto, lamps mark the spot where, traditionally, Jesus was born and the manger in which he was laid. The town has three convents—Greek, Armenian, and Roman Catholic. The inhabitants engage largely in trade and the manufacture of souvenirs and religious objects to sell to pilgrims. Population, *ca.* 10,000.

Bethlen (*bĕt′lĕn*), GABRIEL (in Hungarian, GABOR), prince of Transylvania and briefly king of Hungary, born 1580; died 1629. After the murder (1613) of Gabriel Báthory, Bethlen was elected to succeed him as prince of Transylvania. He joined the Protestant nobles resisting the Catholic Ferdinand II of Bohemia and was successful in Hungary, of which he was elected king in 1620. He renounced the title in 1621, after signing a treaty with Ferdinand (now emperor) which guaranteed religious freedom in Hungary, and was made a prince of the empire. He married Catherine of Brandenburg in 1625 and was only briefly engaged in opposition to the emperor after that time.

Bethlen, COUNT STEPHEN (in Hungarian, ISTVÂN), statesman, born in Gernyeszag, Hungary, Oct. 8, 1874; believed to have died in a Soviet prison camp sometime between 1947 and 1951. He was a descendant of the family to which Gabriel Bethlen (*q.v.*) belonged. He was elected to the Hungarian parliament in 1901 and was among the delegates signing (1920) the Treaty of Trianon. Active in opposing the Béla Kun revolutionary government, he was prime minister (1921-31). With Adm. Horthy (*q.v*), he prevented King Charles IV (as Charles I, last emperor of Austria) from regaining the throne in 1921. He retired from active politics in 1939 but remained influential. Favoring Nazi Germany at first, he later veered toward the Western Allies as Hitler appeared to be losing World War II. He was arrested by Russian troops in 1945.

Bethmann-Hollweg (*bät′män-hôl′våk*), THEOBALD THEODOR VON, jurist and statesman, born in Hohenfinow, Germany, Nov. 29, 1856; died there, Jan. 1, 1921. He studied law and entered the civil service. In 1905 he was made Prussian minister of the interior, in 1907, secretary of state, and in 1909 succeeded Prince von Bülow as chancellor of the German empire. Although his World War I reference (1914) to the Belgian neutrality treaty as "a scrap of paper" became notorious, he later tried to achieve peace between Germany and the Allies. Because of these efforts, he was forced by Hindenburg and Ludendorff (*qq.v.*) to resign (1917) as premier.

Bethsaida (*bĕth-sā′ĭ-dȧ*), in Hebrew, the "fishing place," the name of two villages on the Sea of Galilee, one of which still remains. These villages were on the western and northern shores of the lake. The former was the birthplace of the apostles Peter, Philip, and Andrew; the latter the scene of Christ's feeding of the 5,000.

Bethune (*bȧ-thūn′*), MARY MCLEOD, educator, born in Mayesville, S.C., July 10, 1875; died in Daytona Beach, Fla., May 18, 1955. The last of 17 children and the first to be born out of slavery, she spent her early childhood picking cotton. Her education at the first public school in her neighborhood began when she was nine years old. She was graduated from Scotia Sem., Concord, N.C. After teaching in Negro schools in the South, she opened the Daytona Normal and Industrial Inst., in Daytona Beach, Fla., with a total capital of $1.50. The school grew and prospered, and, in 1923, it was merged with Cookman Inst., to become Bethune-Cookman Coll., of which she was president until 1942. She was director of the Division of Negro Affairs for the National Youth Admin. (1936-44).

Betterton (*bĕt′ĕr-tŭn*), THOMAS, actor, born in London, England, *ca.* 1635; died there, April 28, 1710. He became (1661) a member of Sir William Davenant's company at Lincoln's Inn Fields Theatre and gained note as the outstanding actor of his time. After Davenant died (1668), Betterton went to the Dorset Garden Theatre, as actor-manager, playing in Shakespearean adaptations by Dryden and others. In 1695 he reopened the Lincoln's Inn Fields Theatre with Congreve's "Love for Love" and in 1705 went to the new Haymarket Theatre, built for him by Sir John Vanbrugh. His characterization of *Hamlet* was considered superlative by such critics as Colley Cibber and Samuel Pepys; he was highly regarded by Charles II, who sent him to Paris to view stage practices there. He married (1622) MARY SAUNDERSON (died 1712), an outstanding actress of Shakespearean roles.

Bevan (*bĕv′ạn*), ANEURIN, trade unionist and member of Parliament, born in Tredegar, South Wales, Nov. 15, 1897; died in Chesham, England, July 6, 1960. The son of a miner, Bevan left school at 13 to enter the mines himself. Later, coworkers collected funds and sent him to the Central Labour Coll. Active in the South Wales Miners' Federation, he was sent to Parliament in 1929 and was re-elected at each election throughout his life. He married (1934) Jenny Lee, also a Labour politician.

As minister of health in the postwar Labour cabinet, he was the force behind the nationalization of health·care in Britain (1948). He was appointed minister of labor in 1951 but resigned after a short time in protest against the Labour party's support of rearmament. In 1955 he narrowly escaped expulsion from the Labour party on a charge of disloyalty to party leader Clement R. Attlee (*q.v.*). Bevan was later defeated in a contest for the office of party leader to succeed Attlee; however, he was elected deputy leader in 1959.

Bevatron (*bĕv′ạ-trŏn*). See *Accelerators.*

Beveridge (*bĕv′ĕr-ĭj*), WILLIAM HENRY, 1ST BARON BEVERIDGE OF TUGGAL, economist and member of Parliament, born in Rangpur, Bengal, India, March 5, 1879; died in Oxford, England, March 16, 1963. Graduated (1902) from Oxford Univ., he joined the London *Morning Post* in 1906. For the British government he prepared (1908) a report on the unemployment problem, which resulted in establishment of labor exchanges in Great Britain. Thereafter he served the government in many capacities, but he became best known as the director of the London School of Economics, a position he held from 1919 to 1937. As chairman of the Inter-Depart-mental Committee on Social Insurance and Allied Services (1941), he prepared the famous report known as the Beveridge Plan, which called for a system of social security so sweeping that it was popularly said to cover the period "from womb to tomb." Although the Beveridge report was not put into effect, the Labour government, elected in 1945, did put through legislation resembling parts of it. See also *Great Britain*.

Beverly (*bĕv′ẽr-lĭ*), a city in northeastern Massachusetts, located on Massachusetts Bay, 18 m. s. of Boston, on the Boston and Maine R.R. It has a good harbor, and fishing is important. The industries include shoe machinery, electronics, metal and wood products, clothing, and shoes. Beverly is part of the Boston S.M.S.A., and the city's value added by manufacture was $30,658,000 in 1958. It is the seat of Endicott Junior Coll. The site was settled *ca.* 1630, and Beverly was incorporated as a town in 1668 and as a city in 1894. It has been called "birthplace of the American navy" because the *Hannah*, the first ship of the American navy, was commissioned here in 1775. Population, 1905, 15,222; in 1950, 28,884; in 1960, 36,108.

Beverly Hills, a city in southern California, located 8 m. E. of Los Angeles, which surrounds it. It is part of the Los Angeles-Long Beach S.M.S.A., and the city's value added by manufacture (primarily light manufacturing plants, including electronics) was $18,337,000 in 1958. Its main attractions are the fine shops and noted residences, mostly of members of the motion-picture industry. It was developed *ca.* 1907 and incorporated in 1914. Population, 1960, 30,817.

Bevin (*bĕ′vĭn*), ERNEST, British trade union leader, born in Winsford, Somerset, England, March 9, 1881; died in London, England, April 14, 1951. He gained a wide reputation by securing minimum wages for dockers after an 11-hour speech before the Transport Workers' Court of Inquiry in 1920. Founder of the Transport and General Workers' Union, he became its general secretary in 1922. Entering Parliament in 1940, he became privy councillor and minister of labor and national service in Winston Churchill's war cabinet. He became foreign minister in the Labour government, holding office from 1945 to 1951, when he resigned because of ill health. In his foreign policy, Bevin considerably strengthened Anglo-American relations and strongly opposed the expansionist policy of Soviet Russia. His Palestine policy of pronounced opposition toward Israel (*q.v.*) was frequently criticized. Bevin took a leading part in the work of the Organization for European Economic Cooperation concerning the Marshall Plan and the negotiations leading to the signing of the North Atlantic Treaty (*q.v.*), which ceremonies he attended in Washington, D.C. in 1949.

ERNEST BEVIN

Courtesy British Information Services

Bewick (*bū′ĭk*), THOMAS, engraver, born near Newcastle upon Tyne, England, Aug. 12, 1753; died in Gateshead, Nov. 8, 1828. He was a founder of the modern English school of wood engraving. A collection of about 2,000 prints engraved by himself and his brother, John Bewick, was published under the title "Bewick Collection of Bewick's Wood Cuts." He illustrated Goldsmith's "Deserted Village," joined Beilby in publishing "History of British Quadrupeds," and prepared the illustrations for "History of British Birds."

Beyers (*bī′yûrz*), CHRISTIAN FREDERICK, soldier, born near Stellenbosch, Cape Province, South Africa, in 1869; drowned in the Vaal River, Dec. 8, 1914. He served in the South African War (1899-1902), rising to the rank of general. He was elected first speaker of the assembly in the Transvaal; and, when the Union of South Africa was formed (1910), he was appointed commandant general of the army. In World War I his disagreement with the policy of Jan Christiaan Smuts (*q.v.*) led Beyers to resign. Appealing to the nationalism of the Boers, he led them into revolt. After fighting several unsuccessful engagements, his forces were dispersed, and he himself sought to escape across the Vaal River, where he drowned.

Beyrout (*bā-rōōt′*), a city in Lebanon. See *Beirut*.

Beza (*bē′zạ*), THEODORUS (the Latin form of Théodore de Bèze or Besze), theologian, born in Vézelay, France, July 24, 1519; died in Geneva, Switzerland, Oct. 13, 1605. He was educated in Orléans under the German scholar Melchior Wolmar and later at Paris Univ. In 1548 he went to Geneva where he renounced Catholicism and a year later became professor of Greek at Lausanne. In 1559 he received a pastorate in Geneva and there distinguished himself as a reformer of the church; he was also made rector of the Academy of Geneva, newly founded by John Calvin (*q.v.*). As successor to Calvin he guided French Protestantism until his death.

Béziers (*bā-zyä'*), a city of France, in the department of Hérault, 38 m. s.w. of Montpellier. It is on the Orb River and the Canal du Midi. Béziers is a commercial city, dealing chiefly in wine and alcohol. Its major landmark is the Church of St.-Nazaire, a late-medieval Gothic cathedral; the city was the seat of an episcopal see from the 4th to the 19th centuries. A Gallic fortress, seized by the Romans in the 2nd century A.D. and then known as Baeterrae, Béziers was a stronghold of the 12th-century viscounts of Carcassonne (*q.v.*) and the scene of a massacre by forces under Simon de Montfort (see *Montfort, Simon*) during the Albigensian Crusade (see *Albigenses*). Population, 1954, 64,929.

Bhagavad-Gita (*bŭg'a-vad-gē'tä*), in Sanskrit, the "song of the Lord," a major portion, dating about A.D. 300 to 500, of the Indian epic, the Mahabharata (*q.v.*). It is a philosophical dialogue, dealing with the duties, as appointed by the gods, of the castes of India. The dialogue takes place, on the eve of battle, between Prince Arjuna and his charioteer, the disguised god Krishna (*q.v.*). Another poem, the Bhagavad-Puranas, is a story of the incarnation of Vishnu (*q.v.*) as Krishna. Also in Sanskrit, it is the tenth section of the Puranas (Indian mythological stories).

Bhutan (*bōō-tän'*) or BHOTAN, a country in the Himalayas, bounded by Sikkim and Tibet on the W., Tibet on the N. and E., and India on the S. Bhutan is extremely mountainous; the highest peak, Kula Kangri, reaches 24,780 ft. The area of the country is about 18,000 sq. m. Depending on the elevation, the climate can be tropical, temperate, or cold, and there are many varieties of animals. The people live by stock-raising and farming, usually in terraced fields on the mountainsides, and produce rice, corn, and other grains, vegetables, walnuts, oranges, and cardamoms. Some timber is exported. Manufactures include swords, muskets, lac, wax, cloth, musk, and various crafts. The majority of the 300,000 to 700,000 people are Bhutanese, but there are also Nepalese and some small tribal groups. The chief religion in lamaistic Buddhism (see *Buddhism; Lamaism*).

Since 1907 Bhutan has had a hereditary maharaja, who is an absolute ruler. Punakha is the winter capital, and Tashi Chho Dzong, the summer capital. Little is known about the history of Bhutan before 1700. During the 18th and 19th centuries the Bhutanese often attacked areas of nearby India, until the British defeated them in 1866 and granted them an annual subsidy. Britain's position was assumed by India in 1948. The Indian government does not interfere in the internal affairs of Bhutan but gives guidance concerning external affairs. It also grants Bhutan an annual subsidy.

Biafra (*bē-ä'fra*), BIGHT OF, a widemouthed bay in the eastern section of the Gulf of Guinea, on the west coast of Africa. It borders Gabon, Spanish Guinea, Cameroun, and Nigeria. Principe Island and the island of Fernando Po are in the bight.

Bias (*bī'as*), a scholar of ancient times, one of the Seven Wise Men (*q.v.*) of Greece. He was a native of Priene and flourished in the 6th century B.C.

Bible (*bī'b'l*), the book held by Christians and Jews to contain the word of God and to be of divine authority. The word *Bible* is derived from medieval Latin, "biblia" in the singular number, and means a book. The Greek form of the word is plural and means books. As commonly used it signifies *the book,* in comparison with which other books or writings are unworthy; or, if they be called books, then the Bible becomes *the book of books*. The Latin words *scriptura*=writing, *scripturae*=writings, conveys the idea that the Scriptures are the only writings worthy of being called writings; therefore, they are of higher standing than all other books. This usage came from the Latin clergy and has met general acceptance.

Courtesy American Bible Society

LATIN MANUSCRIPT BIBLE

The Bible consists of two main parts, the Old and New Testament. Roman Catholics and several other Christian groups also include the Apocrypha (*q.v.*) as canonical, but many Protestant churches accept only the Old and New Testament as the canonical word of God. Apocryphal books include those other books and portions of canonical books which are not included in the Hebrew canon but were included in the early Greek translation, the Septuagint (*q.v.*).

Parts of the Old Testament date back into the second millennium B.C. Amos (*q.v.*) was probably the first prophet to write down his message, and it has been handed down largely as it is known today. The canon of the Old Testament was completed about A.D. 90; however, the final form of the Old Testament text, as currently known (the Massoretic text), was not established before the 5th century A.D. The entire text of the Old Testament is in Hebrew, though there are Aramaic passages in Jeremiah 10:2, Daniel 2:4-7:28, Ezra 4:8-6:16 and 7:12-26. Parts of the Old Testament have been freely translated and paraphrased in Aramaic. These paraphrases, the *Targums,* were largely oral and were made for the benefit of those Jews who no longer understood Hebrew but spoke only Aramaic. While such paraphrases were probably made as early as the 5th century B.C., in their present form they date back only to the 5th century A.D.

The Greeks of Alexandria began a translation of the Old Testament as early as the 3rd century B.C., but the entire translation was very likely not completed until the 1st century. This translation, the Septuagint, is the earliest and most famous version, and was adopted by the early Christian Church as well as by the Jews. It has always held an eminent place in Bible history and interpretation. There are other celebrated versions: the Syriac version, begun in the 2nd century B.C. but not completed before the 2nd century A.D.; the Coptic version, in the 3rd or 4th century A.D.; and the Gothic version, in the 4th century A.D. Both the Coptic and the Gothic were made from the Septuagint. Saint Jerome (*q.v.*), in A.D. 405, completed the most important Latin version, largely on the basis of the original Hebrew and Greek, which is known as the *Vulgate* (*q.v.*). The first edition of the entire Hebrew Bible was published in 1488 in Soncino, Italy.

The Bible was written on linen cloth, skins, or papyrus kept in rolls. The books of the New Testament were written in Greek, with the possible exception of the Gospel of Matthew, which was, perhaps, originally written in Hebrew but was translated early into Greek. No other book has been so frequently translated and generally read as the Bible. In modern times, it has been extensively circulated in many languages. See *Bible Distribution.*

Around 1384 the first complete English translation was made by John Wycliffe (*q.v.*) and his followers, though many partial translations had

HEBREW SCROLL

This scroll, containing Genesis, Exodus, and Leviticus 18, is believed to have been copied in China in the 15th century A.D. from scrolls brought from Palestine centuries earlier

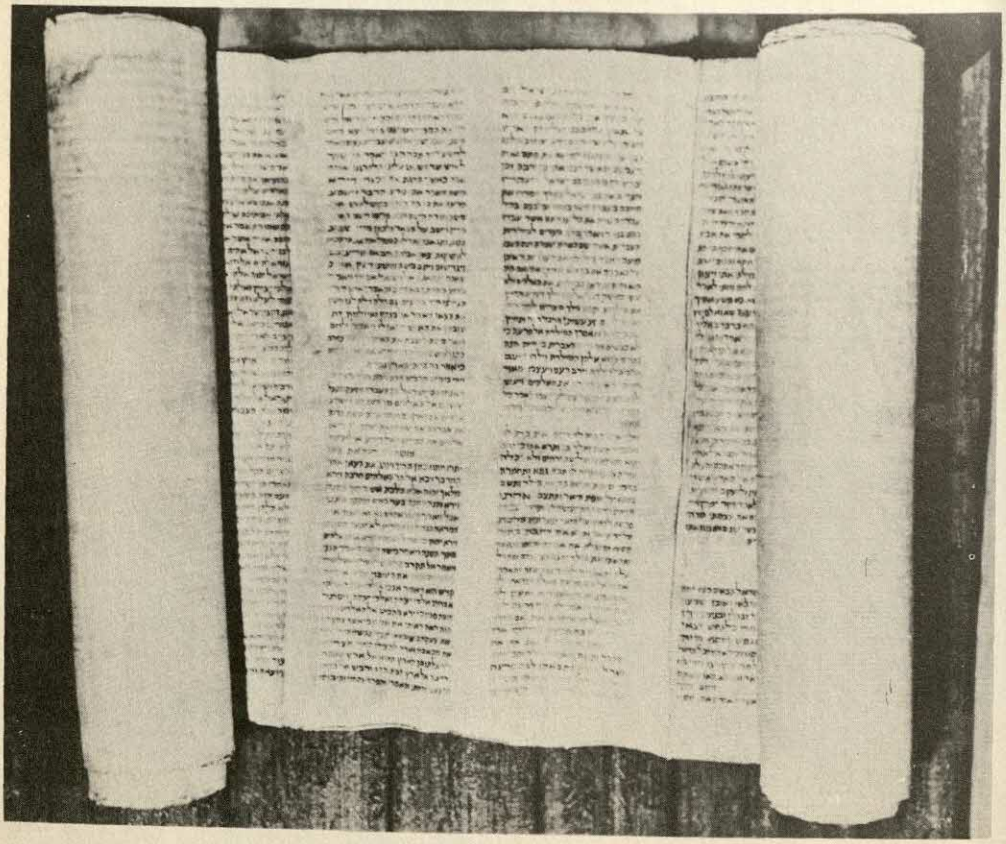


CHART OF THE ENGLISH BIBLE[1]

Name	Source and Date
Hebrew Old Testament	Original texts or manuscript copies; great majority in Hebrew, some in Aramaic
Greek Septuagint	Hebrew Old Testament; translated into Greek about 3rd century B.C.
Greek New Testament	Original texts or manuscript copies; written in Greek about the 1st century A.D.
Vulgate	Translation into Latin by St. Jerome of Hebrew, Greek, and old Latin manuscripts; A.D. 382-405.
Bede's St. John	Partial translation into Anglo-Saxon of the Vulgate, A.D. 735, by the Ven. Bede; no longer extant
Wycliffe Bible[2]	English translation of the Vulgate; 1384, 1395
Tyndale's Bible	Hebrew Old Testament and Erasmus' Latin translation of the Greek New Testament; 1525, 1530-31
Coverdale's Bible	Revision of several translations, including that of Tyndale; 1535
Matthew's Bible	Tyndale, including Coverdale's Apocrypha; 1537
Great Bible	Coverdale's revision of Matthew's Bible; 1539
Geneva Bible	English Puritan revision of the Great Bible; 1557, 1560
Bishops' Bible	Revision of Tyndale and Geneva Bibles; 1568
Rheims-Douay[3]	The Vulgate; 1582, 1609-10
Authorized Version (or King James Bible)	Revision of Bishops' Bible; 1611
Challoner's Revision[3]	Revision of Rheims-Douay; 1749, 1750
English Revised Version	Revision of Authorized Version; 1881, 1885
American Standard Revised Version	American revision of Authorized Version and English Revised; 1901
Weymouth New Testament	Independent translation of Greek New Testament manuscripts; 1902
Old Testament	Jewish Publication Society of America translation of Hebrew Old Testament; 1917
Westminster Version[3]	Translation of Hebrew and Greek manuscripts; 1913-35
Moffatt Bible	Independent translation of Hebrew and Greek manuscripts; 1913, 1924
Goodspeed (and others) Bible	Hebrew and Greek manuscripts, including independent translations of Apocrypha and of Old and New Testaments; 1923, 1927
Confraternity New Testament[3]	The Vulgate; 1941
Knox Bible[3]	Translation by Ronald Knox of the Vulgate; 1944 et seq., full Bible, 1956
Revised Standard Version	Revision of the American Standard Revised; 1946, 1952
Confraternity Old Testament[3]	Translation of the Hebrew Old Testament; 1952 et seq.
Phillips New Testament	Independent translation of Greek New Testament; 1958
"New English Bible: New Testament"	Translation of Greek manuscripts; 1961

[1] In this chart, an independent translation is one prepared by an individual; all revisions, particularly the most recent, used additional Hebrew and/or Greek manuscripts to aid in correcting or revising the source cited. [2] All succeeding versions in this chart are in the English language. [3] Intended for the use of Roman Catholics.

already been made. This translation, known as the Early Version of the Wycliffe Bible, was followed by a Revised or Later Version between 1395 and 1397.

In 1525-26 William Tyndale (*q.v.*) printed an English New Testament in Germany, and Miles Coverdale (*q.v.*) published the first complete Bible in English in 1535 under the encouragement and protection of Lord Cromwell and Bishop Cranmer (see *Cranmer, Thomas; Cromwell, Thomas*). The first version authorized by the ecclesiastical authorities is the so-called Great Bible of 1539, which, together with several other translations (Geneva or Breeches, Bishops', Matthew's Bible, *et al.*), formed the basis of the Authorized Version, or King James Bible. This translation, ordered by King James I of England at the Hampton Court Palace conference of 1604, was undertaken by 47 scholars divided into six companies. They spent three years in preparatory work and three years in joint work on the translation. A special committee then spent nine months on revision. The Authorized Version was published in 1611 in London. Because of its literary style, it is the most popular of the English versions.

The earliest English version approved by the Roman Catholic Church was made from the Vulgate. The New Testament translation was first published at Rheims, France, in 1582, and the Old Testament, at Douay, France, in 1609-10. The entire Bible appeared in 1633-35. Other Catholic versions followed, one of the more recent being the Westminster Version. There is no authorized Catholic version, but Catholics may read a version approved by local ecclesiastical authorities.

The first complete translation of the Bible by an American scholar, Charles Thomson (1729-1824), appeared in 1808 in Philadelphia, Pa. The first Bible printed in America was the Indian Bible translated by John Eliot (*q.v.*), which was published in Cambridge, Mass., in 1661-63. The first book printed in America was the "Bay Psalm Book," 1640, and the first complete English Bible in America was printed by Robert Aitken in 1782 (Philadelphia), though some contend that an edition had come out in 1752 purporting to have been printed in London.

In 1870 the Convocation of Canterbury appointed a committee to undertake a new revision of the Authorized Version. Two groups of scholars and churchmen were formed, one for translating the Old Testament and the other for translating the New. Two similar companies were organized in America to aid the British scholars. The Revised Version of the New Testament was published in 1881, that of the Old Testament in 1885. The latest revision of that text—by a group of 40 American scholars—was published in 1952. Though the newer revisions are more accurate, the King James Bible is still popular. The translation into German begun by Martin Luther in 1522 and completed in 1534 holds equal rank with the English; of all the early translations into the modern languages, it is the most noted for its clarity and accuracy.

New versions of the Bible continue to be issued. The newest translation is "The New English Bible: The New Testament," which appeared in 1961; it was translated directly from Hebrew and Greek and is not a revision of a previous translation. Modern-day revisions include the New Testament (published in 1941) and the Old Testament (Vol. I, 1952, with others following) of the Confraternity of Christian Doctrine of the Roman Catholic Church. Not so new, but notable, is the English-language Old Testament (published in 1917) of the Jewish Publication Society of America.

Versions of the Bible and their sources are covered in the accompanying chart.

The Jews divide the Old Testament into three divisions: the Law, the Prophets, and the Sacred Writings. The *Pentateuch,* as the five Books of Moses are usually called, contains the Jewish law, but it also includes prophecy, history, and biography. The Prophets are divided into two groups, the Former and the Latter. The *Former Prophets* begin with Joshua and include Judges, I and II Samuel, and I and II Kings; in some versions, the last four of these are known as I, II, III, and IV Kings. The *Latter Prophets* include the groups of books called the Major Prophets, *i.e.,* Isaiah, Jeremiah, and Ezekiel, and the 12 Minor Prophets, *i.e.,* Hosea through Malachi.

The other Old Testament books form the *Sacred Writings.* These include poetry, such as Job, Psalms, Song of Solomon, and Lamentations; historical or pseudohistorical books, such as Chronicles, Ezra, Nehemiah, Ruth, and Esther; and one apocalyptic book, Daniel.

The Septuagint and Vulgate translations rearranged the Biblical books in what was thought to be a more logical historical sequence than the order above, and their rearrangement was later followed in the English versions. The Old Testament contains 39 books and about 23,214 verses. They include the history of the Jewish people, their praise of God in psalms, their lamentations, proverbs, and prophecies. The whole contains many promises that the people are to be delivered out of all earthly troubles and attain perfect bliss by the advent of a Messiah. These prophecies are still held by the Jews to indicate the coming of a deliverer, to whose advent they still look with hopeful confidence, while Christians believe the promised deliverer is Jesus Christ.

The New Testament commences with the *Gospels,* four accounts of the life of Christ by Matthew, Mark, Luke, and John. The Gospels are followed by the *Acts of the Apostles,* which give an account of the early church and its foundation. Then follow the 21 letters of Paul and other apostles to the churches and fellow workers as they were engaged in spreading the gospel and organizing the first Christian communities. The last book of the New Testament is the Revelation of St. John the Divine, also called the Apocalypse. The books of the New Testament usually appear in uniform order, while the order of the Old Testament depends largely on its translation.

The division of the Old Testament according to Jewish custom is referred to in Luke 24:44—"And he said unto them, These are the words which I spake unto you, while I was yet with you, that all things must be fulfilled, which were written in the law of Moses, and in the prophets, and in the psalms, concerning me."

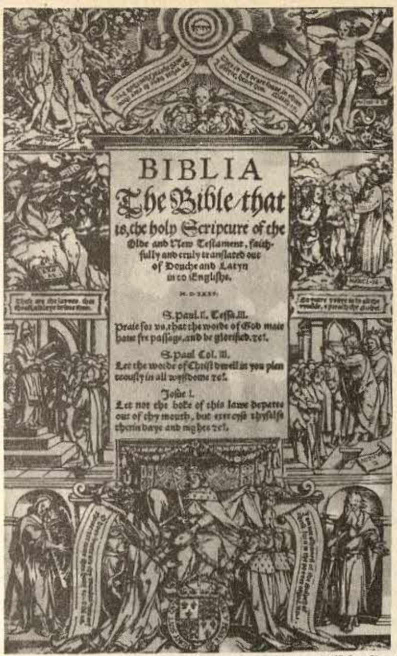
The order of the books in the Authorized Version is followed in the lists below:

OLD TESTAMENT

Genesis
Exodus
Leviticus
Numbers
Deuteronomy
Joshua
Judges
Ruth
I Samuel
II Samuel
I Kings
II Kings
I Chronicles
II Chronicles
Ezra
Nehemiah
Esther
Job
Psalms
Proverbs
Ecclesiastes
The Song of Solomon
Isaiah
Jeremiah
Lamentations
Ezekiel
Daniel
Hosea
Joel
Amos
Obadiah
Jonah
Micah
Nahum
Habakkuk
Zephaniah
Haggai
Zechariah
Malachi

NEW TESTAMENT

Matthew
Mark
Luke
John
Acts of the Apostles
Romans
I Corinthians
II Corinthians
Galatians
Ephesians
Philippians
Colossians
I Thessalonians
II Thessalonians
I Timothy
II Timothy
Titus
Philemon
Hebrews
James
I Peter
II Peter
I John
II John
III John
Jude
Revelation of St. John the Divine



BIBLIA
The Bible/that
is, the holy Scripture of the
Olde and New Teſtament, faith-
fully and truly tranſlated out
of Douche and Latyn
in to Engliſhe.

M.D.XXXV.

S.paul.II. Teſſa.III.
Praie for vs, that the worde of God maie
haue fre paſſage, and be glorified.ꝛc.
S.paul Col. III.
Let the worde of Chriſt dwell in you plen
teouſly in all wyſſdome ꝛc.
Joſue I.
Let not the boke of this lawe departe
out of thy mouth, but exercyſe thyſelfe
therin daye and nyghte ꝛc.

Courtesy American Bible Society

TITLE PAGE OF COVERDALE BIBLE, 1535

Not included in most modern Protestant printings of the Authorized Version is the Apocrypha, usually listed in this order:

I Esdras
II Esdras
Tobit
Judith
Rest of Esther
The Wisdom of Solomon
Ecclesiasticus
Baruch
The Song of the Three Holy Children
The History of Susanna
Bel and the Dragon
The Prayer of Manasses
I Maccabees
II Maccabees

The Greek Septuagint included most of the above, but the Roman Catholic Church excludes II Esdras and The Prayer of Manasses; some of the others are combined with other canonical books.

No matter under what form of translation the various books appear, the content of the Bible attempts to give an account of the world as the creation of an Almighty Creator, always and everywhere present. It concerns both the origin and government of mankind and exhibits the relation of man to his Creator. Perhaps the world's greatest literary masterpiece, the Bible contains practically every literary form, including the lyric, the lament, the dialogue, the parable, the fable, the proverb, the prayer, the rhapsody, etc. Abounding in vivid pictures and natural characterizations, the Bible excels in prose as well as in poetry. Many commentaries and interpretations of the Bible have appeared, especially since the textual criticism in the *"Novum Testamentum"* (1516) of Erasmus (*q.v.*); man's conception of the Bible has undergone numerous changes with the advance of history. It remains, however, the greatest tribute to man's religious experience.

BIBLIOGRAPHY

The Mazarin Bible was the first to be printed from movable metal type, possibly by Johannes Gutenberg (*q.v.*), at Mainz, Germany, in 1455 or 1456. A Vulgate Bible, it is also known as the Latin Bible of 42 lines, referring to its 42-line column, of which there are two to a page, with room for illuminated initials. The name refers to Jules Cardinal Mazarin (*q.v.*), in whose library the first copy to attract attention was found in 1760.

A number of Bible curiosities were pointed out by Dr. Thomas H. Horne (1780-1862), an English bibliographer, with reference to the Authorized Version. Among them are the following. The Bible contains 3,566,480 letters, 773,746 words, 31,173 verses, 1,189 chapters, and 66 books. The word "and" occurs 46,227 times; the word "Lord," 1,853 times. The middle verse is Psalms 118:8. In Ezra 7:21, all the letters of the alphabet except "j" are used. II Kings 19 and Isaiah 37 are alike, as are Ezra 2 and Nehemiah 7:6-73. The longest verse is Esther 8:9, and the shortest is John 11:35.

See also separate articles on individual books and persons mentioned above.

Bible Distribution, an enterprise having for its object the translation of the Bible into all spoken languages and its circulation for the dissemination of the Christian cause. The enterprise took definite form in the founding of the great Bible societies, of which the leading are the British and Foreign Bible Society (1804) and the American Bible Society (1816). Similar societies were founded early in Scotland, Holland, Norway, and elsewhere. The work of these societies has been restricted to aiding translators, publishing and distributing the Bible without note or comment and without purpose of profit. They have never engaged in teaching or expositions of the biblical text.

Some part of the Bible has been printed in 1,181 languages; 226 for the whole Bible, 281 for the New Testament, and 674 for some lesser portion of the Scripture.

Since 1940, the movement for the recognition of indigenous Bible societies in so-called mission lands has been making progress, with the organization of the Japan Bible Society, the Bible Society of Brazil, the Indonesian Bible Society, and the Bible Society of India and Ceylon.

Although the rapid rise in literacy in many parts of the world is paralleled by increasing distribution of Scriptures, the need for additional Scriptures has not, by any means, been met. The members of the United Bible Societies in 1960 supplied a total of 35,512,581 Scriptures throughout the world.

The Bible societies are supported principally by churches and individual gifts.

Bibliography (*bĭb-lĭ-ŏg′rạ-fĭ*), the science of knowledge of books, relating both to the external features and the value of their contents. The subject is sometimes divided into *pure bibliography,* which relates to the external feature of books, and *applied bibliography,* which takes cognizance of their repute and degree of value. A classification of a list of works treating of some particular branch of knowledge is called a *bibliography,* such as a bibliography of electricity or one of political economy. Conrad von Gesner (1516-65), of Switzerland, prepared his "Bibliotheca Universalis," in which he published a very extensive list of books issued in the Hebrew, Greek and Latin languages. The work known as "The American Catalogue," published in New York City, contains a comprehensive list of authors and a title index of books published in the U.S., supplemented with an annual issued from 1886-1911, and by the *Publisher's Weekly* since then. The "English Catalogue" contains a similar list of books or works published in Great Britain, as does the "Reference Catalogue of Current Literature," published every four years. A large number of German works of this kind have been issued, notable among which is Kayser's "Complete Book-Lexicon." Lorenz's "General Catalogue" is a very comprehensive French work. American works that should be mentioned in this connection are the "U.S. Catalogue" with its annual supplements since 1902 and its monthly supplement, the "Cumulative Book Index," and the "Standard Catalog for Public Libraries"; Evans' "American Bibliography . . . 1639-1820" and Sabin's "Dictionary of Books relating to America"; "The Publishers' Trade List Annual"; "American Book-Prices Current"; Wilson's "Bibliographic Index"; and such publications as the *Library Journal* and *Papers of the Bibliographical Society of America.*

A selected listing of books in various fields, briefly described, will be found at the end of the text in Volume XII of the "World Scope Encyclopedia," comprising a current bibliography.

Bicameral (*bī-ķăm'ēr-ạl*), having two chambers or legislative branches. The bicameral legislative system in the U.S. is embodied in the Constitution and is employed in most states. The Congress of the U.S. (Senate and House of Representatives) and the British Parliament (Houses of Lords and Commons) are outstanding examples of the bicameral system.

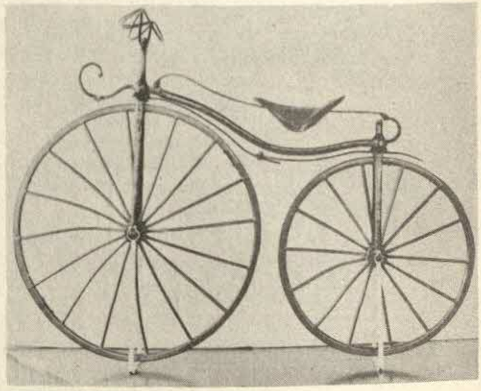
Biceps (*bī'sĕps*), the large muscle of the upper arm, which gives a full appearance to the front part of that limb. At the lower end it is attached to the radius by a tendon, and at the upper extremity to the scapula. The action of the biceps is to bend the elbow. At the outer and posterior part of the thigh is another biceps. The muscle back of the arm, which works in unison with the biceps, is called triceps.

Biconcave Lens (*bī-ķŏn'ķāv lĕnz*), a transparent material, usually glass, which has two concave spherical faces ground on its opposite sides. The lens diverges the rays of light and will not produce an image on a ground glass screen. Any object viewed through the lens will appear erect, but smaller and more distant than the object. A biconcave lens was used for the eyepiece of Galileo's telescope and is still in general use.

Biconvex Lens (*bī-ķŏn'vĕķs*), a transparent material, usually glass, which has two convex spherical faces ground on its opposite sides. The lens converges the rays of light striking it and is capable of producing real images on a ground glass screen. It may produce an enlarged image and is used in telescopes and in cameras.

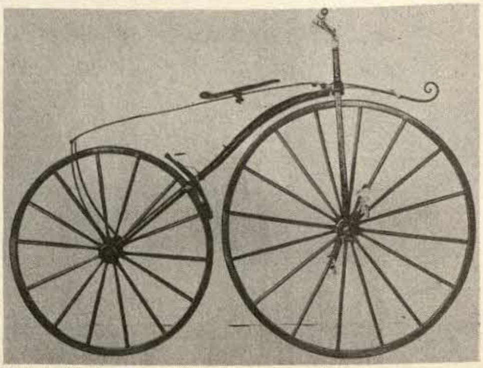
Bicycle (*bī'sĭ-ķ'l*), a two-wheeled machine for riding by pressing the feet on pedals. The modern safety bicycle has been brought to a high state of perfection and has assumed an important place as a means of locomotion. It serves for pleasure and for convenience in travel.

The first bicycle was introduced into England in 1818. It consisted of a two-wheeled contriv-



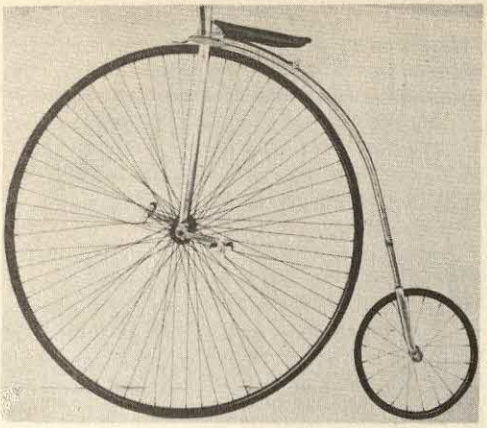
HOBBY HORSE OR WALKER

Introduced into England in 1818



BONE SHAKER

This bicycle, typical of those manufactured in England between 1867 and 1870, was the first to have two pedals on the front wheel



HIGH WHEEL

Popular between 1872 and 1892, this bicycle has a 52-inch wheel

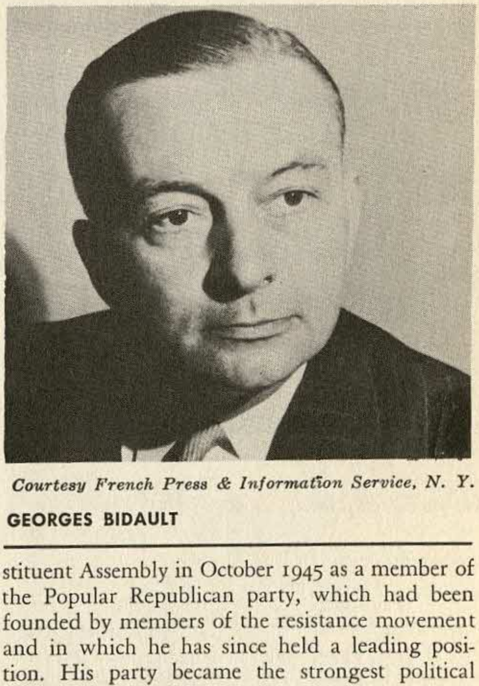
ance with a seat affixed to a wooden beam, on which the rider sat astraddle, and by kicking the ground facilitated moving forward. This finally led to the idea that a two-wheeled machine could be so made as to stay erect by its motion alone. In 1869 a bicycle was manufactured in Europe known as the *bone-shaker,* which consisted of one large and one smaller wheel, and a wood and iron frame; later rubber tires and steel frames were added. The bicycles made in 1880 weighed about 50 pounds and had high wheels with rubber tires. The modern bicycle, originally known as the "safety" because of its identical wheels, came into use about 1890.

The tandem bicycle is designed for two persons and weighs about the same as two single bicycles. The tandem attains higher speed than a single bicycle on level ground or down hill, but more effort is required on steep upward gradients.

The manufacture of high-grade bicycles dates from about 1895, when machines weighing only about 20 pounds were introduced. This pattern is now in general use. It has pneumatic tires, tubular steel frames, ball-bearings, and endless chains. The pneumatic tire is made of several thicknesses of canvas enforced by vulcanized rubber, and contains an endless air-tight rubber tube. It is held to a steel or wooden rim. Ball-bearings greatly reduce friction, and tubular frames aid in the reduction of weight.

See also color plate, *The Evolution of Land Transportation,* Volume XI.

Bidault (*bĭ-dō′*), GEORGES, statesman, born in Moulins, France, in 1899. Bidault served with the French army during World War I, studied at the Sorbonne after the war, and later taught history. In addition to teaching, during the years between the two World Wars he wrote editorials for the Catholic Democrat daily, *L'Aube*. He also worked as a leader of the Popular Democratic party, a group of leftist Catholics, until 1936, when his party joined the Popular Front. Upon the declaration of war against Germany in 1939, Bidault again joined the army, and was taken prisoner the following year. In 1941 he was released, as a veteran of World War I, and returned to France. Here he joined the underground movement and accepted a teaching position at Lyons Univ., in unoccupied France, in order to cover up his activities. He helped to organize the National Resistance Council which cooperated with De Gaulle's Free French movement, and became head of the organization after its leader, Moulin, was killed by the Nazis. When France was liberated, Bidault was appointed minister of foreign affairs (Sept. 1944). He was elected deputy to the National Constituent Assembly in October 1945 as a member of the Popular Republican party, which had been founded by members of the resistance movement and in which he has since held a leading position. His party became the strongest political group in France in the election of June 1946 and Bidault was made President-Premier of the Provisional Government; however, his party lost its majority later in the year. From 1947 to 1948 he was foreign minister in succeeding cabinets. He represented his country at many international conferences and at the Council of Foreign Ministers, and has gained a reputation for his diplomatic skill.



Courtesy French Press & Information Service, N. Y.

GEORGES BIDAULT

Biddeford (*bĭd′dē-fērd*), a city of York County, Maine, on the Saco River, 15 m. s.w. of Portland. It is on the Boston & Maine R.R. The granite in its vicinity is inexhaustible in quantity and superb in quality. The city is surrounded by an agricultural country and has many factories. It was settled in 1630, incorporated in 1718, and became a city in 1855. Population, 1900, 16,145; in 1940, 19,790; in 1950, 20,836.

Biddle (*bĭd'd'l*), FRANCIS, lawyer, former U.S. Attorney General, born in Paris, France, May 9, 1886. A member of an old Philadelphia family, he attended school at Haverford, Pa., and Groton, Mass., and was graduated from Harvard Univ. (1909) and Harvard Law School (1911) *cum laude*. His career as lawyer includes private practice as well as many government assignments, such as special assistant U.S. attorney (1922-26), judge of the U.S. Circuit Court of Appeals (1939-40), Solicitor General (1940), and Attorney General (1941-45). He has also held various government assignments, *e.g.*, National Labor Relations Board (1934-35), U.S. judge of the International Military Tribunal at Nuremberg, convicting the German Nazi leaders for committing crimes against the people and for aggressive warfare.

Courtesy N.B.C.

FRANCIS BIDDLE

Biddle, GEORGE, lithographer and artist, born in Philadelphia, Pa., Jan. 24, 1885. He received his LL.B. from Harvard Univ. (1911) but changed his mind about a law career and sailed for France to take up painting. After the outbreak of World War I, Biddle returned to the U.S., enlisted in the army (1917), and was sent to France. In 1920, he went to Tahiti, returning two years later to exhibit his work in New York. He soon went on to Europe to continue his work and study and it was not until the early 1930's that he came back to America to do a large mural for the Chicago Century of Progress Exposition. Biddle's most important mural assignment was in 1935, when he painted the panels for the new Justice Building in Washington, D.C. A few years later he went to Rio de Janeiro to work on two large fresco paintings in the main lobby of the Biblioteca National in that city, the first commission ever given to a U.S. artist by a South American nation. Biddle was instrumental in inaugurating the Federal Arts Project, established by President Roosevelt in 1933. In 1943, he was appointed chairman of the War Department Art Advertising Committee. During his career as an artist, Biddle has had over 50 one-man exhibitions in Paris, Rome, Vienna, Mexico City, and in most American cities.

Biddle, JAMES, naval officer, born in Philadelphia, Pa., Feb. 28, 1783; died Oct. 1, 1848. He attended the Univ. of Pennsylvania, and in 1800 entered the navy as a midshipman for service in the war with Tripoli. While on board the frigate *Philadelphia,* he was taken a prisoner and confined for several months. In the War of 1812 he was lieutenant on the *Wasp,* which captured the *Frolic,* and later he commanded this vessel. Both the *Wasp* and *Frolic* were captured by the British and taken to Bermuda, but he was exchanged in 1813 and commanded in the operations in the East Indies. He received a gold medal from Congress for gallant services and subsequently was made captain. He served on the Pacific coast during the Mexican War.

Biddle, JOHN, founder of modern Unitarianism, born in Gloucestershire, England, in 1615; died Sept. 22, 1662. His education was secured at Oxford, and soon after he became master of a school at Gloucester. The fearless manner in which he announced and advocated his views caused his imprisonment. A tract circulated by him, entitled "Twelve Arguments Drawn Out of Scripture, Wherein the Commonly Received Opinion Touching the Deity of the Holy Spirit Is Clearly and Fully Refuted," caused him to be summoned before a committee of Parliament, and he was sentenced to imprisonment by that body. In 1652 an act was passed by which he was granted complete freedom. After holding numerous meetings and publishing his opinion in "Twofold Scripture Catechisms," he was again imprisoned. Cromwell banished him to St. Mary's Castle, Scilly Islands. After three years he returned to England and was again committed to jail for advocating his views.

Bidwell (*bĭd'wĕll*), JOHN, statesman, born in Chautauqua County, New York, in 1819; died in Chico, Cal., Apr. 4, 1900. He was educated at Kingsville Acad., Ohio, and engaged in school teaching. In 1841 he emigrated to California and volunteered in the Mexican War, in which he rose from second lieutenant to major. He was elected to the state senate in 1849 and to Congress in 1864. In 1892 he was the nominee of the Prohibition party for the Presidency.

Biela's Comet (*bē'lä*), a comet discovered in 1772, again in 1805, and again in 1826, the last time by an Austrian officer named Wilhelm von Biela (1782-1856), from whom it was named. He calculated its orbit, and showed that the period was six and one-half years. It appeared in 1832, 1839, 1846, and 1852, but since then has not been observed. At its appearance in 1846 it was split into two parts, which phenomenon was also observed six years later. It is thought that the meteoric showers in 1885, 1892, and 1899 were due to the earth passing through the orbit of the lost body.

Bienville (*byăṉ-vēl′*), JEAN BAPTISTE LE MOYNE, SIEUR DE, officer and explorer, born in Montreal, Canada, Feb. 23, 1680; died in France in 1768. He was joined by his brother, Lemoine Iberville, in an expedition to the mouth of the Mississippi River, and in 1699 made a settlement at Biloxi. In 1701 he was made director of the colony and removed the capital from Biloxi to Mobile. He was dismissed from office in 1707, but was reinstated in 1718 by John Law's Mississippi company, and in the same year founded New Orleans and soon after made it the capital. He was again removed as governor in 1726 and reinstated in 1733, and returned to France in 1743. Bienville's policy in respect to religion was one cause of his failure to make the colony a success, as he banished the Jews and prohibited worship except by the Roman Catholics. His laws remained in force until Louisiana Territory was acquired by the U.S.

Bierring (*bēr′rĭng*), WALTER LAWRENCE, physician, born at Davenport, Ia., July 15, 1868. He studied at the State Univ. of Iowa, at Vienna, at Heidelberg and at the Pasteur Inst. in Paris. For many years, beginning in 1893, he was a professor of the theory and practice of medicine at the State Univ. of Iowa and at Drake Univ. Since 1933, he has been State Commissioner of Public Health, Iowa, and was president of the American Medical Association (1934-35).

Bierstadt (*bēr′stät*), ALBERT, eminent artist, born at Düsseldorf, Germany, Jan. 7, 1830; died in New York City, Feb. 18, 1902. In 1867 he was granted the decoration of the Legion of Honor, having become a member of the National Acad. in 1860. Among his most famous paintings are: "The Valley of the Yosemite," "Looking Down the Yosemite," "California Oaks," and "Discovery of the Hudson River."

Bigamy (*bĭg′ȧ-mȳ*), the offense of marrying while the former wife is still living, or while the former husband is still alive, without first obtaining a divorce. It is defined in the criminal law as a statutory offense and is punishable by fine and imprisonment, or both.

Big Ben (*bĭg bĕn*), one of the landmarks of London, England; popular name for the big clock in one of the towers of the Parliament building. The bell, weighing 13½ tons, was cast by George Mears in 1858. It owes its name to Sir Benjamin (Ben) Hall who at that time was director of public works.

Big Bethel (*bĕth′ẹl*), a village of Virginia, between the James and York Rivers, 10 m. N.W. of Fortress Monroe. It was the scene of an engagement in the Civil War, on June 10, 1861, when Gen. B.F. Butler with 2,500 Federals made an attack upon 1,800 Confederates under Gen. F.W. Pierce. Several attempts were made by the Federals to carry the works by assault, but the attacks were repulsed, and the Confederates retired during the night.

Big Black River (*bĭg blăk rĭv′ẽr*), *1*) a tributary of the Mississippi River rising in Choctaw County, Mississippi, U.S. It is about 200 m. in length, 50 m. of which are navigable. During the American Civil War, the Battle of Black River Bridge (May 17, 1863) figured in Gen. Grant's successful advance on Vicksburg, then held by Gen. Pemberton's Confederate forces; *2*) a tributary of the Porcupine River in Alaska; *3*) one of the eastern tributaries of Lake Winnipeg, Canada.

Bigelow (*bĭg′ẹ-lō*), POULTNEY, author, born in New York City, Sept. 10, 1855; died in Saugerties, N.Y., May 28, 1954. His father, John Bigelow (1817-1911), was part owner of the New York *Evening Post* and prominent in state politics. After study at Yale and Columbia Law School, Poultney Bigelow was admitted to the

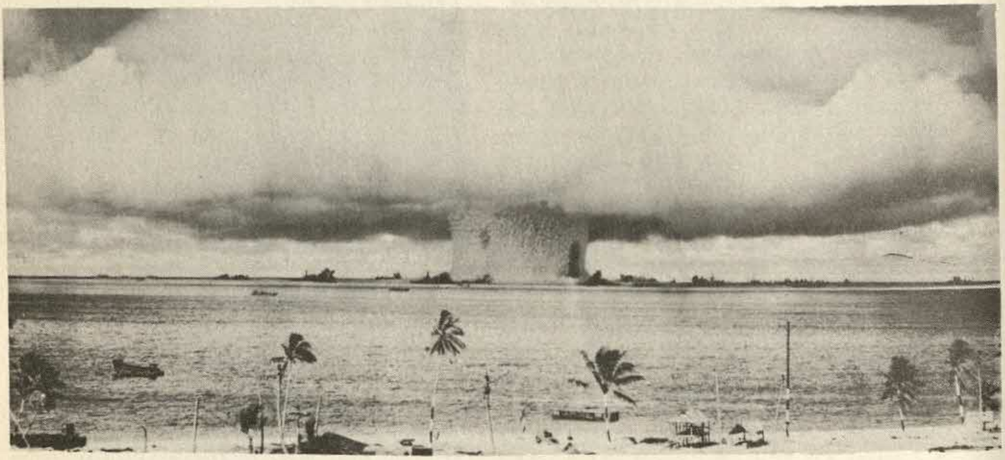
Courtesy British Information Services

BIG BEN

bar, but soon gave up his practice for journalism. From 1875-76 he made a tour of the world, visited the shores of New Guinea, traveled in China and Africa, and returned by way of Europe. He crossed the continent of Europe with a canoe, and was the first to pass with that kind of a vessel through the Iron Gates of the Danube. He lectured at Yale, Columbia, Chicago, Leland Stanford, Johns Hopkins, and many other universities. During the Spanish-American War he was correspondent to the *London Times.* He was expelled from Russia after publishing "The Borderland of the Czar and Kaiser." Among his other works are: "The German Emperor and His Neighbors," "White Man's Africa," "Paddles and Politics Down the Danube," "Children of the Nations," and "History of the German Struggle for Liberty." He wrote his autobiography, "Seventy Summers," in 1925.

Big Horn (*bĭḡ hôrn*). See *Rocky Mt. Goat.*

Big Horn River, a tributary of the Yellowstone, which rises in the northwestern part of Wyoming, in the Wind River Range. In its upper course it flows toward the southeast, which part is known as the Wind River, then north through the Big Horn Mts. in Montana, and joins the Yellowstone near Big Horn, Mont. The scenery in the upper part of its course is famous for its beauty. Its length is about 380 m.



Courtesy Press Association, Inc.

"TEST BAKER" AT BIKINI

Atomic blast produced this mushroom-shaped cloud formation a moment after the explosion. The gap in the right side of the column of water is at about the position of the battleship *Arkansas* which was sunk

Bignonia (*bĭg-nō′nĭ-ȧ*), a genus of flowering shrubs, so named from the Abbé Bignon. About 100 species have been described, most of which are native to South America. Many are twining shrubs with tendrils and are cultivated extensively in gardens. The *trumpet flower* is a well-known species.

Big Rapids (*bĭg răp′ĭdz*), a city in Michigan, county seat of Mecosta County, on the Pennsylvania R.R. Located on the Muskegon River, it had its beginning as one of the leading lumber centers of Michigan. Today its chief manufactures are gloves and women's wear. It is situated in an agricultural area in which dairying, livestock raising, and fruit farming are important. Ferris Inst., a coeducational college, is located here. Big Rapids is also the center of a recreational and resort district. Population, 1905, 4,852; in 1940, 4,987; in 1950, 6,736.

Big Sandy (*bĭḡ săn′dȳ*), a tributary of the Ohio River, formed at Louisa, Ky., by the junction of the Tug Fork and West Fork. The West Fork has its source in the southwestern part of Virginia and flows through Kentucky, and the Tug Fork rises in West Virginia. The latter and the Big Sandy form a part of the boundary between Kentucky and West Virginia. The Big Sandy is navigable its entire course of 18 m., from Louisa to the Ohio River, the West Fork for 80 m.

Bihar (*bē′hŏr*). See *Behar and Orissa.*

Bikini (*bĭ-kē′nĭ*), a coral atoll in the North Pacific, one of the 33 Marshall Islands which belonged to Germany before they were mandated to Japan after World War I and which came under American occupation after the Japanese surrender in 1945.

Bikini, one of the smallest of the Marshall Islands, is approximately 5 m. long and about as wide. It achieved international as well as historic importance when it was designated (1946) as the site of the American atomic bomb experiment, "Operation Crossroads" (code name for the test), of atomic explosive power on warships and other fleet units anchored for this purpose at Bikini.

Costing an estimated $90,000,000, "Operation Crossroads" was carried on in two parts. "Test Able" (July 1, 1946), in which a single bomb was dropped on the target fleet from a B-29, represented an effort to gauge the efficacy of atomic air attack on the modern navy. "Test Baker" (July 25, 1946), an underwater burst in which the bomb was exploded at a moderate depth below the surface, was designed to imitate an attack on a fleet gathered within a harbor area. The tests proved conclusively the tremendous potentialities of the atom bomb as a naval weapon, although the radius of destruction was considerably smaller than many had expected.

The 160 inhabitants of Bikini were removed to Rongerik, an atoll 140 m. to the southeast. The natives' mode of life is primitive. Their houses were built of pandanus leaves, and their main occupations were fishing and the harvesting of coconuts, pandanus, and breadfruit. The head of the Bikinian government was the Paramount Chief Juda, a hereditary position. The Juda and other lesser chiefs owned the land, judged crimes and received almost half the island's annual crop of coconuts. However, democratic principles adhered to include the consultation of the family heads before making any important decisions.

Bilbao (*bĭl-bä'ō*), Spain, capital and chief seaport of the Basque province. Founded about 1300, it became the seat of the *consulado,* the highest commercial tribunal, in the 15th century. Bombarded in 1874 by the Carlists, it was also a center of resistance to the Franco armies in the Spanish Civil War, 1936-39. The power of Bilbao as a port depends largely on the Basque iron and copper deposits; it is also a shipbuilding center. Population, *ca.* 200,000.

Bilbo (*bĭl'bô*), THEODORE GILMORE, Senator from Mississippi, born near Poplarville, Miss., Oct. 13, 1877. He studied law at Vanderbilt Univ. In 1907, while still at Vanderbilt, he was elected to the Mississippi State Senate and served from 1908-12. He became lieutenant-governor the year his term in the Senate ended, and was elected governor in 1916. He retired to his farm and private law practice from 1920-23, then moved to Jackson, Miss., where he established the *Free Lance,* a weekly political organ which he used for his campaign to be re-elected governor in 1928. When his second term as governor had ended (1932), he went to Washington and worked in the Agricultural Adjustment Administration. A whirlwind campaign (1934) won him a seat in the U.S. Senate by a narrow margin. Re-elected in 1940 and '46, he was refused his Senate seat in 1947, pending a Senate investigation into charges that he used intimidation to prevent Negroes from voting, and accepted bribes. However, in the ensuing controversy, the Senate tabled his credentials "without prejudice" until Bilbo's health could be restored, but he died (Aug. 21, 1947) before the matter was resolved. In the Senate, Bilbo was known for his leadership in the fight against a Fair Employment Practices Committee, antilynching legislation, and poll tax repeal.

Bile (*bīle*), the fluid separated from the blood of the portal vein by the cells of the liver, where it is collected by the biliary ducts. These unite to form larger ones and finally merge into the right and left hepatic ducts, which unite to form the common hepatic duct. The last mentioned unites with the cystic duct to form the common bileduct, which opens on the mucous surface of the second part of the duodenum. Bile is secreted continuously, though most rapidly an hour after eating, and a supply is retained in the gall bladder, whence it flows continuously. It is of a golden-red color, and bitter taste, and is somewhat viscid. In the process of digestion, it serves to aid more or less, especially in reducing the fatty substances and stimulating the peristaltic motion of the intestines, and in disinfecting the contents of the large intestine. The amount secreted daily is from 20 to 50 ounces. Gall stones result from solidification of the bile, and biliousness is caused when bile is not secreted in due quantity.

Bill (*bĭl*), 1), in accounting, the statement of an account for goods sold, services rendered, or work done, either written or printed. It may state the amount claimed by the creditor in gross or by items. When the term is used to describe a legal or commercial document, it is associated with other words that define its application.

BILL, 2), in legislature, a form of statute proposed for passage in either branch of the legislative department, which, after passing both houses and receiving the executive's signature, becomes a law. In the U.S. a bill for raising revenue must originate in the House of Representatives, but amendments may be proposed in the Senate.

Bill of Attainder, a legislative enactment to punish the person or persons guilty of treason or felony, involving the loss of all personal and real property and the infliction of cruel and unusual punishments. A person attainted cannot sue or testify in any court, or claim any civil rights or legal protection, and cannot receive or transmit any property by inheritance. Great Britain abolished bills of attainder in 1870, and the Constitution of the U.S. forbids the passage of such a bill.

Bill of Costs, an itemized list of the costs of an action at law. It is filed by the successful party and is subject to the approval of the clerk or some similar officer, and the amount verified is added to the judgment.

Bill of Exception, in law, a statement of objections made by an attorney in the course of a trial to the ruling of a judge. The objections are made for the purpose of putting the points decided on record so they may be reviewed by the full bench or by a higher court to which an appeal may be taken, and if the exceptions are well founded the case is reversed or remanded for new trial.

Bill of Exchange, a written order signed by the person issuing it, in which another is directed to pay a third party a specified sum of money and charge it to the account of the first. The person issuing it is the drawer; the one receiving it, the payee; and the one to pay it, the drawee; frequently triplicates are written, one for each of the three parties interested. A foreign bill of exchange is drawn in one state or country and payable in another, and a domestic bill is drawn and payable within a state. Bills of exchange are commonly called drafts, and the largest volume of business in all commercial centers is transacted in drafts and personal checks.

Bill of Health, a certificate issued by a consul or other proper officer to the master of a ship clearing out of a port in which contagious diseases are epidemic, or are suspected to be, certifying to the state of health of the crew and passengers on board.

Bill of Indictment, a written document presented to a grand jury, accusing one or more persons of having committed a felony or high crime. If the grand jurors consider the evidence sufficient to support the accusation, they indorse it *A true bill,* but if the evidence is insufficient it is marked *Not a true bill.*

Bill of Lading, a memorandum of goods shipped by vessel bearing the signature of the master of the vessel, who acknowledges the receipt of the goods and agrees to transfer them in good condition to the point of destination, natural damages excepted. The term is applied in the same manner to bills covering shipments made by railroads, but they are frequently called waybills or freight receipts.

Bill of Rights, in government, a summary of the fundamental rights and privileges claimed by the people. The principles of political liberty in Great Britain are defined in the *Bill of Rights* adopted by Parliament in 1689, after the Prince and Princess of Orange became king and queen, and it is one of the three great documents of that country. The first 10 Amendments to the U.S. Constitution are referred to by the same name, since they set forth specifically certain inalienable rights of the people. After the revolution in France, in 1789, a number of bills of rights were enacted by the conventions.

Bill of Sale, a formal statement issued as evidence of the sale of personal property. Such an instrument is necessary when the property sold does not pass into the possession of the purchaser, but remains in the custody of the party who sold it. To make such a bill valid in some states or countries, against the claim of a third party, it is necessary to have it recorded in the public records of the town or county. A bill is frequently given to a creditor as security for borrowed money or as surety that an account will be paid.

Billboard (*bĭl′bōrd*), a flat surface, such as a board or a panel, used for the display of advertising posters. In 1890, such surfaces, then called *field boards,* were introduced in England along the roadsides. In the U.S. billboards are erected along railroads and highways, atop buildings, etc.

Billet (*bĭl′ĕt*), a military term referring to an order served on a household requiring it to house a soldier or soldiers, also the place in which a soldier is so lodged.

Billiards (*bĭl′yẽrdz*), an indoor game played on a rectangular table of varying sizes but always twice as long as wide, *e.g.,* 5′ x 10′. All tables have slate beds with rubber cushioned rails. Both beds and rails are cloth-covered. Ivory or plastic balls are activated by means of a cue, usually made of maple shafts and varying woods for the butts. Shafts are tapered and pointed with ivory-buckhorn or fiber and tipped with leather which is chalked to permit a grip when making contact with balls, thereby preventing miscuing. Cue lengths usually vary from 54″ to 60″.

There are several styles of tables to care for various games, namely carom, pocket and snooker billiard tables. Carom billiard tables have no pockets. Most games on this table are played with three balls, one red and two white, one of which is spotted to distinguish it from opponents' cue ball. The size of the ball is $2^{25}/_{64}$″. Scoring is effected by contacting opponent's cue ball and red ball on a single stroke of cue against player's cue ball. This constitutes a carom. Usual games are three-cushion and balk-line.

Courtesy Billiard Assn. of America, Chicago

BILLIARD CHAMPION WILLIE HOPPE

Pocket billiard tables have six pockets, four at corners and two at side centers. Usually games are played with fifteen object balls and one cue ball—the size of the ball being 2¼". Object balls must be driven into pockets by contacts with cue ball to score. Usual games are 14-1 continuous (professional championship style), line-up, and rotation.

In snooker pocket billiards, the pockets are located in the same positions as on other pocket tables but are smaller and the cushions are rounded at pocket entrances, thereby increasing hazard. Balls are 2$\frac{1}{16}$", smaller than for other types of pocket tables.

The game of American snooker is played with fifteen red balls, six numbered balls and one cue ball. Scoring is effected by pocketing a red ball before pocketing a numbered ball. Varying styles of games are played on this table.

Rules and regulations of all accepted games are promulgated by the Billiard Association of America, the governing body of this game, which is one of the oldest of record, dating far back into history.

Billings (*bĭl′ĭngz*), a city in south central Montana, seat of Yellowstone County, *ca.* 245 m. S.E. of Helena. Billings is on the Great Northern Ry. and the Northern Pacific Ry. The city trades in farm products and manufactures sugar and electrical and farm equipment. Billings dominates the Billings standard metropolitan statistical area (2,635 sq. m.; pop., 1960, 79,016), which comprises all of Yellowstone County. The area had a value added by manufacture (1958) of $33,518,000; the city's value added was $14,399,000. The Eastern Montana Coll. of Education and Rocky Mountain Coll. are located here. Billings was incorporated in 1885. Population, 1960, 52,851.

Billings, JOHN SHAW, surgeon and librarian, born in Switzerland County, Indiana, Apr. 12, 1838. He was educated at Miami Univ. and at the Ohio Medical Coll., and after graduating from the latter, in 1860, he was appointed active assistant surgeon in the army. In 1863 he was with the Army of the Potomac, serving at the time in the battles of Gettysburg and Chancellorsville, and the following year was attached to the surgeon general's office in Washington, where he was curator of the Army Medical Museum Library. Subsequently he was professor of hygiene at the Univ. of Pennsylvania, served as librarian of the New York public library, and took an active part as a member of several distinguished foreign medical associations. Besides publishing many reports upon the mortality and vital statistics of the U.S., he issued: "Description of the Johns Hopkins Hospital," "Principles of Ventilation and Heat," "National Medical Dictionary," "Social Statistics of Cities," and "Index-Catalogue of the Surgeon General's Office." He died Mar. 11, 1913.

Billings, Josh. See *Shaw, Henry Wheeler.*

Billingsgate (*bĭl′ĭngz-gāt*), a wharf and fish market in London, England, located near the London bridge, on the Thames. This market was established in 1699, and has continued to be free and open for the sale of all kinds of fish. The term *billingsgate* originated from this market, due to the coarse or abusive language heard there in former times.

Billion (*bĭl′y′n*), one thousand millions or 1,000,000,000 in the U.S. and France; in England and Germany, a billion is one million millions or 1,000,000,000,000.

Billon (*bĭl′lôn*). In coinage it is an alloy of silver or gold with an excess of base metal, such as copper or tin. In olden times, this alloying of gold and silver was used as a means of depreciation of currency.

Billroth (*bĭl′rōt*), ALBERT CHRISTIAN THEODOR, surgeon, born in Bergen, Germany, 1829; died, 1894. He was appointed professor of surgery at the University of Zürich, Switzerland, in 1859, and at the University of Vienna, Austria, in 1867. In addition to his distinguished work as a teacher and surgeon, especially in the field of modern abdominal surgery, he made important contributions in histology and pathology. Billroth was also a gifted pianist and an intimate friend of Johannes Brahms.

Billy the Kid (*bĭl′ ĭ THē ḳĭd*). See *Bonney, William H.*

Biloxi (*bĭ-lŭḳ′sē*), a city in southern Mississippi, on the Gulf of Mexico, in Harrison County,

Courtesy Bettmann Archive, N. Y.

BILLROTH AT THE OPERATING TABLE

Surrounded by a student audience, 1890

ca. 12 m. E. of Gulfport. Biloxi is on the Louisville & Nashville R.R. Known primarily as a canning and packing center for oysters and shrimp, the city also engages in shipbuilding, fertilizer production, and lumber-milling. Biloxi had a value added by manufacture (1958) of $5,681,000. Points of interest are the cross and boulder commemorating the landing of the French in 1699; "Beauvoir," the last home of Jefferson Davis; and Keesler Air Force Base. Biloxi was settled by the French in the early 18th century, was ceded to Great Britain in 1763, fell into Spanish hands in 1781, and became part of the U.S. in 1811. It was incorporated as a city in 1896. Population, 1950, 37,425; in 1960, 44,053.

Bimetallism (*bī-mĕt'ạl-ĭz'm*), the doctrine that both gold and silver should be adopted at the same time, in the same country, as standard money, of full legal tender, and bear to each other a fixed ratio established and recognized by the government. It is opposed to monometallism, which is the doctrine of a single monetary standard. The two doctrines have caused political dissension in all civilized countries. The contention reached the culminating point in the U.S. in 1896, year of the Presidential election (Republican William McKinley's defeat of Democratic William Jennings Bryan, the advocate of bimetallism), although much discussion was given to this phase of the money question from the early organization of the government.

The parity of both gold and silver has been disturbed by various causes, such as the adoption of the single gold standard in some countries, whereby the demand for gold was correspondingly increased; the discovery of large quantities of gold and silver, whereby the relative quantity in the world was varied; and the demonetization of silver in a number of countries, whereby the use of silver was materially limited.

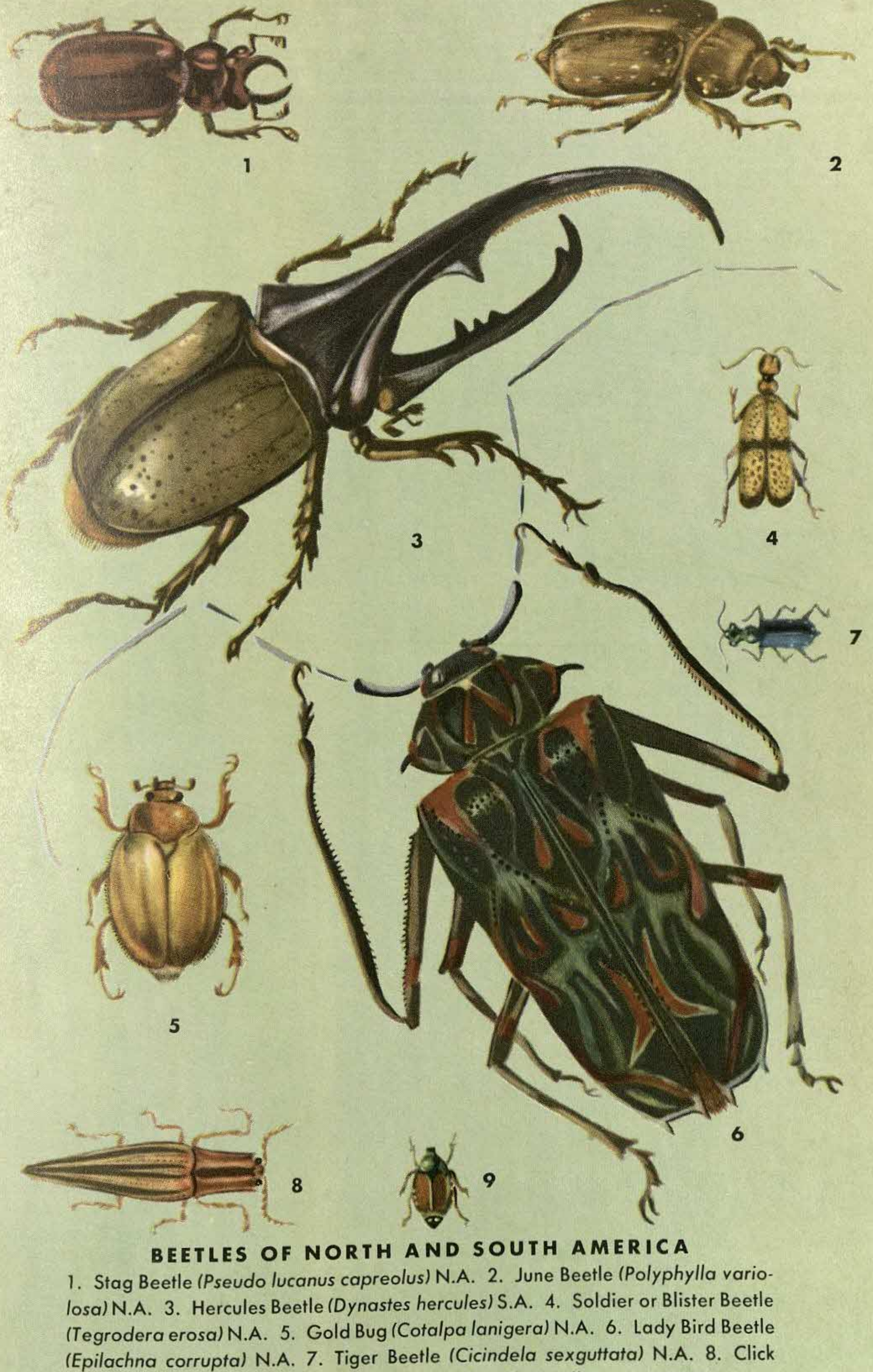
The proper ratio of the coinage is generally held to be about 16 to 1 by the advocates of bimetallism, for the reason that the production of silver in the world has been in weight about 16 times that of the production of gold. However, other ratios are advocated and have been maintained, tending to vary in accordance with supply and demand.

The *battle of the standards,* as the conflict between the two doctrines is called, does not result, as popularly believed, from the discovery of vast gold fields in California in 1849 and in Australia in 1851. Although the discovery of new gold would tend to weaken the price for gold and strengthen the price of silver, on the contrary, the single gold standard grew in popularity throughout the 19th century. The battle of the standards really began when the position of silver was weakened. It is said that the relative values of gold and silver from 1600 B.C. to the beginning of the Christian era stood about as 1 to 12 to each other, never falling below 1 to 9 and never exceeding 1 to 14. From the Christian era to 1640 A.D. the ratio of the market value of gold and silver stood from 1 to 10 to 1 to 15, while from 1640 to 1872 it stood uniformly from 1 to 14 to 1 to 16. A legal ratio of 1 to 15½ was long maintained by a number of European governments. The greatest variations in ratio have occurred since 1872, being generally 1 to 17.

Binding Twine (*bīnd'ĭng twīn*), an article of commerce which attained its greatest utility with the general use of the self-binding harvester. The best quality is made of Manila hemp produced in the East Indies, particularly that secured from the banana palm, which abounds in the Philippine Islands. Other hemp of use in its manufacture grows in Yucatan and Southern Mexico. The sisal twine is secured from the American aloes. The binding twine sold on the market is wound into balls of 650 ft. each, so wrapped that they unwind from the inside.

Binet (*bē-nĕ'*), ALFRED, psychologist, born in Nice, France, July 8, 1857. He studied in his native town and in Paris, took a course of study in law and medicine, and in 1880 began an extensive investigation of experimental and pathological psychology. As director of the laboratory of physiological psychology at the Sorbonne in Paris, he made extensive research into the application of the method of hypnotism to psychological problems. Many of his writings have been translated into English and have become basic material for psychological research. With a co-worker, Binet began making deep researches into the workings of the human intelligence. After five years of study they published, in 1908, a series of 56 tests for children from 3 to 12 years of age. Each test consisted of a series of simple tasks that a child might be expected to perform in accordance to its age group. The child was then graded on the number of tasks completed in a satisfactory manner. Binet died in 1911.

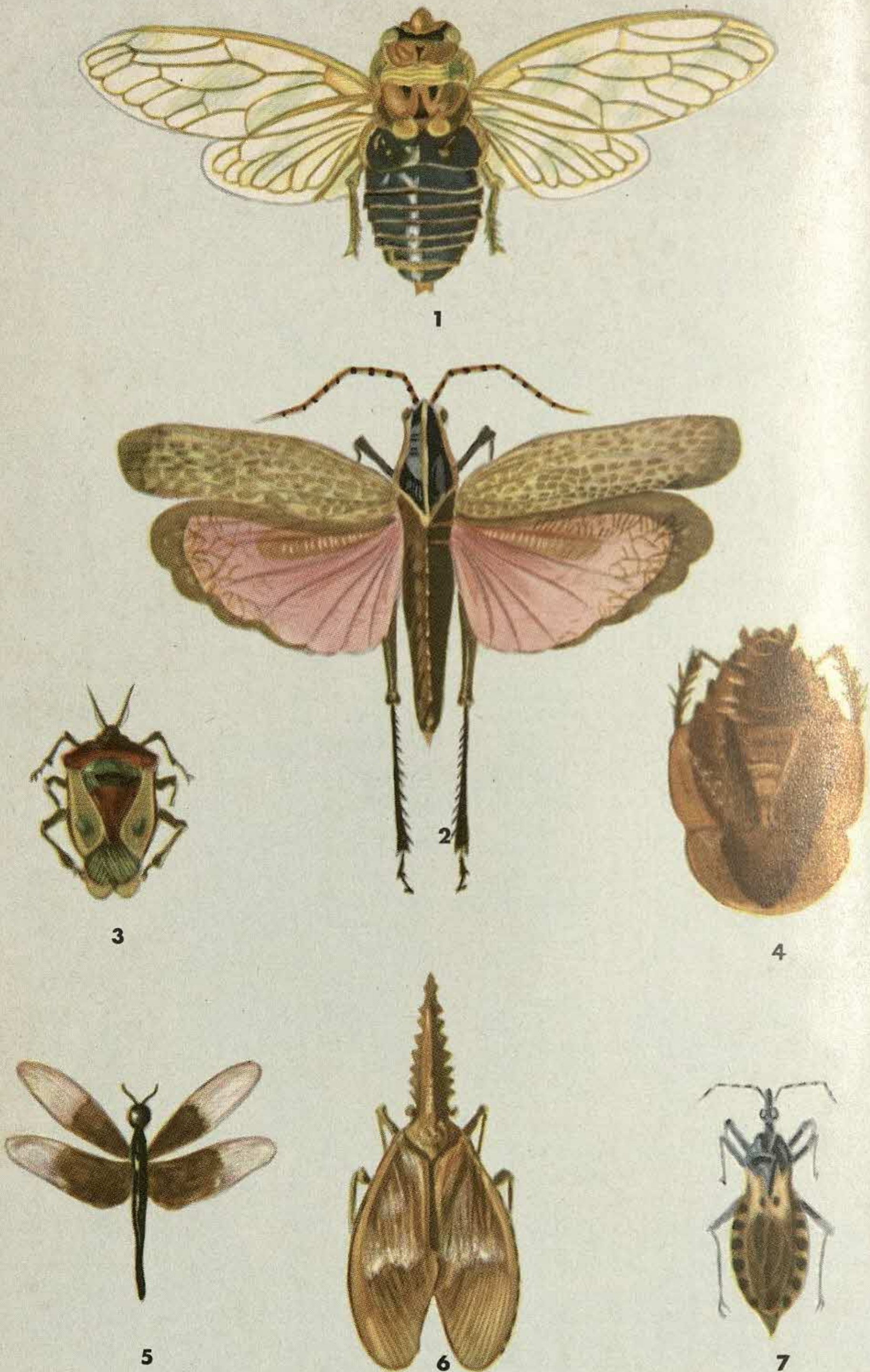
Bingen (*bĭng'ĕn*), a city in southwestern Germany, in Rhenish Hesse, on the south bank of the Rhine, *ca.* 17 m. s.w. of Mainz. Bingen has a large river trade in coal, fertilizer, wine, and wood. Its manufactures include cigars and wine. Rhenish Technical Coll. is located here. Bingen is the site of the Mäuseturm, built *ca.* 970. In this tower, according to legend, Archbishop Hatto was devoured by mice in search of the quantities of grain he had hoarded there against famine. The Castle of Klopp, constructed on the ruins of a Roman fortress, is on a hill overlooking the city. Bingen's name is of Celtic derivation; the place fell (A.D. 70) to the Romans, who drove out the Gauls in the battle of Bingium. Bingen joined the Hanseatic League in 1254, was captured by the French in the 30 Years' War, and joined



BEETLES OF NORTH AND SOUTH AMERICA

1. Stag Beetle *(Pseudo lucanus capreolus)* N.A. 2. June Beetle *(Polyphylla variolosa)* N.A. 3. Hercules Beetle *(Dynastes hercules)* S.A. 4. Soldier or Blister Beetle *(Tegrodera erosa)* N.A. 5. Gold Bug *(Cotalpa lanigera)* N.A. 6. Lady Bird Beetle *(Epilachna corrupta)* N.A. 7. Tiger Beetle *(Cicindela sexguttata)* N.A. 8. Click Beetle *(Semiotus distinctus)* S.A. 9. Japanese Beetle *(Popillia japonica)* N.A.

[Approx. original size]



TROPICAL INSECTS OF THE WORLD

1. Cicada (*Thopha saccata*) Australia 2. Grasshopper (*Taeniopoda biermeisteri* Bol.) Mexico 3. Stink Bug (*Catacanthus carrerrai* Le G.) Queensland, Australia 4. Cockroach (*Aspiduchus deplanatus* Sauss) Central America 5. Dragonfly (*Neurothemis fulvia*) China 6. *Cathedra serrata Fabricius* Brazil 7. Kissing Bug (*Triatama dimidiata* Latr.) Canal Zone, Central America [Approx. original size]

Hesse in 1803. Population, 1949, 15,378; in 1956, 18,048.

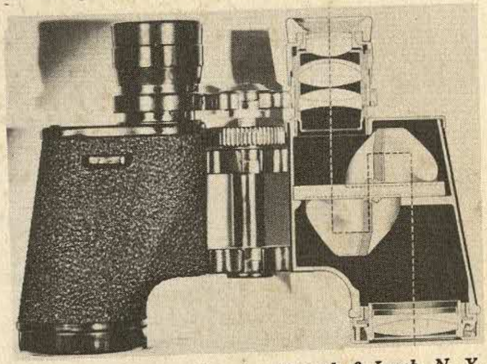
Bingham (*bĭng'ăm*), JOHN ARENDE, jurist, legislator, born in Mercer, Pa., in 1815; died March 19, 1900. He studied at Franklin Coll., Ohio, and in 1854 was elected as a Republican to Congress, serving consecutively until 1863. In the latter year he was made judge advocate in the army, had charge of the trial of Lincoln's assassins, and served in Congress from 1865 until 1873. He was one of the attorneys in the impeachment proceedings against Andrew Johnson. In 1873 he was made U.S. minister to Japan and served continuously for 12 years.

Binghampton (*bĭng'ạm-tŭn*), a city in south central New York, seat of Broome County, located at the confluence of the Chenango and Susquehanna rivers, *ca.* 78 m. s. of Syracuse. Binghamton is on the Delaware and Hudson (freight) and the Erie-Lackawanna R.R.'s. Together with nearby Endicott and Johnson City, Binghampton forms the Triple Cities, noted for shoe manufacturing. Aircraft, clothing, photographic supplies, and textiles are also manufactured here. The city dominates the Binghampton standard metropolitan statistical area (710 sq. m.; pop., 1960, 212,661), which comprises all of Broome County. The area had a value added by manufacture (1958) of $242,601,000; the figure for the city alone was $87,199,000. Binghampton was incorporated in 1867. Population, 1960, 75,941.

Bingo (*bĭng'gō*), or BEANO, a game of chance played with disks and numbered cards. A caller shakes up the disks, then selects one at a time. As each disk number is called, the players cover the corresponding number if it occurs on their cards. The first player to cover all the numbers in one of the lines is the winner. Any number of people can play the game which is a form of lotto, or keno. Bingo is frequently employed as a money-raising device at country fairs and by various organizations, each player paying a certain sum for the privilege of playing a game.

Binney (*bĭn'nĭ*), HORACE, jurist, born in Philadelphia, Pa., Jan. 4, 1780; died Aug. 12, 1875. He was graduated with honors from Harvard Univ., was admitted to the bar, and in 1833 was elected to Congress, where he opposed Andrew Jackson in the affairs of the U.S. Bank. Subsequently he practiced law and became noted on account of his able argument before the Supreme Court on a question relating to the legality of the bequests of Stephen Girard (*q.v.*). He published: "Life and Character of Chief Justice Marshall" and "The Privilege of the Writ of Habeas Corpus Under the Constitution."

Binoculars (*bĭn-ŏk'yo͞o-lärz*), a pair of low-power telescopes by means of which distant objects may be viewed with both eyes. The short length of the binocular makes it more convenient than the telescope for following moving objects. Binoculars usually employ lenses for magnifying the image and prisms for making it erect. The power of the binocular represents the apparent increase in size of objects viewed through it.



Courtesy Bausch & Lomb, N. Y.

BINOCULARS

Cross section showing path of light rays

Binomial (*bī-nō'mĭ-ạl*), in algebra, an expression that consists of two terms, such as $a+b$ or $7-3$; a *trinomial* consists of three terms, as $a+b+x$, or $5+3-2$. An algebraic expression consisting of three or more terms is called a *polynomial.* Sir Isaac Newton was the first to employ the binomial theorem, using it to raise a binomial to any power or to extract any root of it by approximating series.

Biobio (*bē-ō-bē'ō*), the largest river in Chile, rises in the Andes, and after a course of 200 m. discharges into the Pacific near the city of Concepción. At its mouth it is about 2 m. wide.

Biochemistry (*bī-ō-cĕm'is-trȳ*), a branch of chemistry. Biochemistry deals with the materials entering into the structure and processes of living things.

Living things, plant, animal, or micro-organisms, are composed of unit sacs of living matter or cells. The cell wall forms a dividing membrane of semi-permeable material which separates it from the extra-cellular environment. Within the cell are cytoplasm, a fluid; nuclei and chromatin bodies with vacuoles and other material of special function, such as chlorophyl.

When cells are found in multicellular organisms, they become specialized and perform definite functions such as the transfer of nervous stimulus, muscular contraction, the formation of secretions, etc. One important specialization is that of reproduction which transmits the hereditary characteristics of the entire structure, the chemistry of which is now under intensive study.

Such industrial processes as the production of alcohol and gases by the growth of yeast cells are also a province of biochemistry, as is the industrial use of enzymes, the chemistry of medicine, and foods.

Biogenetic Law (*bī-ō-jē-nĕt′ĭk*), discovered by Ernst Haeckel (1834-1919), German scientist. It states that each species develops along a line parallel with that of the series or forms ancestral to it and recapitulates in its own growth the stages of the forefathers of his race. Thus, the human embryo runs through the stages of a worm, a fish, etc., before reaching the final stage of a mammal.

Biography (*bī-ŏg′rȧ-fȳ*), the department of literature which treats of the lives of individuals. When written by the individual himself, it is termed *autobiography*. Biographies differ in the mode of treatment, from a bare statement of the facts or fictionalized facts to a learned discourse on and interpretation of the subject, his works, ideas, etc. Early biographies largely reflected the author's personal beliefs. They include Plutarch's "Parallel Lives," of the 1st century A.D., Nepos' "Lives of Military Commanders," and Suetonius's "Lives of the Twelve Caesars." Biographical literature as we generally conceive it today (unprejudiced and interpretative) originated in the 17th century with Walton's "Life of Donne" and Fuller's "Worthies of England," although a famous biographical work, Vasari's "Lives of the Painters," appeared in the 16th century. An important stimulus to biography was the publication of what is probably England's greatest biographical work, the monumental life of Samuel Johnson by Boswell, in 1791. Outstanding biographies since that time have been: (18th century) Samuel Johnson's "Lives of the Poets"; (19th century) John Gibson Lockhart's "Life of Sir Walter Scott," Sir George Otto Trevelyan's "Macaulay," Ernest Renan's "Life of Jesus," Thomas Carlyle's "Frederick the Great"; (20th century) Lytton Strachey's "Eminent Victorians" and "Queen Victoria," Amy Lowell's "Keats," André Maurois's "Ariel," Emil Ludwig's "Goethe" and "Bismarck," Carl Sandburg's "Abraham Lincoln," and Douglas Southall Freeman's "R. E. Lee."

Notable autobiographies include those of St. Augustine (354-431), Benvenuto Cellini (1500-71), Samuel Pepys (1633-1703), Benjamin Franklin (1706-90), Casanova (1725-78), and Leon Trotsky (1879-1940).

Biographical dictionaries originated in the 15th century, but not until 400 years later did they acquire any great stature. Important works in this field are: Stephen and Lee's "Dictionary of National Biography," "Allgemeine deutsche Biographie," "Nouvelle Biographie générale," and "Dictionary of American Biography." Less scholarly, but in the same line are works such as "Who's Who" and "Current Biography," non-critical reference works giving information on contemporaries.

Biological Warfare (*bī-ō-lŏj′ĭ-kal wôr′fâr*). See *Germ Warfare*.

Biology (*bī-ŏl′ō-jȳ*), the science that embraces all phenomena of life. It includes the scientific inquiries into the origin of life and its various changes from the earliest period until now. While in earlier times the phenomena of life, including psychology, the study of the human mind, and sociology, the study pertaining to man in society, were all considered as comprising the field of biology, today the study is customarily confined to problems which concern the material data of living matter. The development of natural science in the 18th century culminated in the fundamental biological theories of Cuvier, Lamarck, and, in the 19th century, of Darwin. The separation of organic living matter was the first condition to stabilize a specific science of life. This separation was made when three distinctive properties of living matter were definitely stated: each unit of living matter has *first* a specific chemical composition; *second* it is exposed to disintegration (waste) by oxidation, after which it may be reintegrated in combination with new and different matter; *third*, all living matter generates from pre-existing living matter (eggs and seeds, etc.), never directly from inorganic matter.

The arch element of life's chemical composition is protein which is found *only* in living bodies and water. This combination of fluid is called protoplasm. Protein proper represents a complex of carbon, nitrogen, hydrogen, and oxygen. The exact chemical formula for this combination has not yet been found.

The disintegration of living matter is characterized by the decomposition of the protoplasm into more highly oxidated chemical combinations. To replace this constant chemical loss, new elements of protoplasm of simpler chemical combination must be supplied. Assimilation of the new material with the existing protoplasm and the resulting reconstruction are the characteristic phenomena of life. The body of a living being, plant or animal, keeps its form in this way. If the reconstructed matter exceeds the waste, the living mass grows.

The fact that life can generate only from pre-existing living matter leads us to the phenomenon of birth. It is known which parts of the egg cells define the form of the future being (see *Gene* and *Chromosome*) but why these elements develop into a form obviously inherited is still unknown. This is the greatest secret of life.

These three phenomena, shared only by living matter, definitely characterize life. Life can exist only under certain conditions, specifically only if there are a certain minimum of moisture and certain limits of temperature. The temperatures at which life can still exist differ with different beings, such as bacteria, spores, fungi, plants, animals, and men. Atmospheric pressure and degree of dryness are important, too.

A further quality of life is organization. All living things have a definite structure. The higher the species, the more complicated the structure.

The explanation of the origin of life cannot be found in natural science; it is a metaphysical question. In any case, no gradual transition from inorganic to organic life has ever been found, despite all discoveries of so-called "living crystals."

Biology is today subdivided into four divisions; but it must be remembered that the great biologists of the past combined research and knowledge of all four divisions. The divisions of biology are *morphology, distribution, physiology* and *aetiology*. The first relates to the anatomy and history, the second to geography and geology, the third to organic functions, and the last to the causes and origin of life. The study of plant life is called *botany;* of animal life, *zoology*.

Bioluminescence (*bī-ô-lū-mĭ-nĕs′ęns*). See *Phosphorescence.*

Biophysics (*bī-ô-fĭz′ĭks*), the science which applies the quantitative and mechanical methods of physics to the development of life.

Biotin (*bī′ō-tĭn*), a factor which is apparently necessary for cell growth, which was first isolated from egg yolks. It is found in all living cells, particularly in embryonic tissue. It has also been identified in tumorous growths. The white of eggs contains a substance, *avidalbumin,* which unites chemically with biotin and inactivates it. In the egg, avidalbumin is apparently a control factor so that the developing embryo's growth is maintained at a normal rate. The feeding of large quantities of egg whites to test animals may produce symptoms known as "egg white injury." Biotin has also been called vitamin H, but this is a confusing term, since two other forms of vitamins have also been given this name.

Birch (*bĕrch*), a genus of trees found in the colder regions of America and Eurasia, including no less than 25 species. In the temperate climates they attain a height of 70 ft., while in cold climates, as in Greenland, they dwindle down to a mere bush, known as the *dwarf birch*. The wood is tough, firm, and light in color; the bark is smooth, shining, and whitish or a chalky white. It is one of the most useful of woods. The bark is used by savages in building huts and canoes, and by civilized people for tanning and in the production of valuable oil. Birch wood enters into the manufacture of furniture, wooden shoes, barrels, and water wheels, and is used for construction purposes. It is found farther north in North America than any other deciduous tree, and the only tree in Greenland. For this reason it serves a valuable purpose ar fuel in the cold regions inhabited by the Laplanders and Eskimos. The *white birch* and the *yellow birch* are familiar trees in many parts of Canada and the U.S.

Bird of Paradise (*bûrd ŭv păr′a-dīs*), a bird of beautiful plumage allied to the crows, native to the New Guinea area. The family includes a number of species, some of which are remarkable for beauty in color and plumage. The *king bird of paradise* has a magnificent plume of feathers, which comes up from under the wings and branches over the back. It is the most beautiful bird of this family and is quite rare. Other species include the *red bird of paradise,* the *golden bird of paradise,* and the *emerald bird of paradise.* Most of these birds are small; the largest species attain a length of about 2 ft. The plume is found only in the male, whose feathers form an article of commerce. It is used for ornamentation and for trimming hats. The plumage is so rich and varied that in this respect these birds excel all others, even the humming birds. Knowledge of these birds dates from 1857, when A.R. Wallace discovered them while on a voyage to Australasia.

KING BIRD OF PARADISE

Birds, the second class of the subkingdom of vertebrate animals, which stands between the mammals above and the reptiles below. They agree with the mammals in being warm-blooded and with the reptiles, amphibia, and fishes in being oviparous, that is, their young are born from eggs, while the mammals bring forth their young alive and suckle them for a time. They are bipeds and are feathered, and wings are used by all but a few species in flight. The blood circulates rapidly and is warmer than in other vertebrates, and consequently they are animals of great energy. They breathe not only through the lungs, but have air cells in various parts of the body, which aid in respiration. The feathers essentially resemble hair of other animals, and are found only in the bird class. The plumage on the lower parts of the body of most birds is formed by a thick coating of feathers embedded in the skin, called *down*. The shape, the light feather coating, the powerful wings, the peculiar tail, the air cells, and the strong muscles are important factors in fitting them for flight. Their feathers are renewed periodically; the plumage of winter in many species differs from that of the summertime. The young change their plumage many times before they attain their full-grown shape.

The agility of birds enables them to fly, swim, and move rapidly on land. Their bones are thin and contain numerous air cells, while air is also found in the feathers and in various parts of the body. The swift-flying birds have more air cells than those of slower flight, while birds that do not fly possess very few, as the ostrich, which has cells only in the thigh bones. In breathing, the air passes from the lungs into the cells at will; some birds have the capacity to fill even the quills of large feathers. Birds of colder regions are covered with much warmer coating than those of hot climates in order to withstand the cold.

The food of birds differs widely. Some live on a mixture of plant and animal food, while others live entirely on insects and some entirely on flesh. The food is swallowed in large particles, or whole, and passes through the gullet into the first stomach, or crop, in which it is softened by soaking. It then passes by another part of the gullet into the gizzard, a strong and muscular cavity, in which it is mixed with gastric juices. The grain-eating birds have a large crop into which the seeds swallowed by them pass, where they are moistened by a liquid secretion. The strength of the gizzard depends upon the kind of birds; those that eat flesh have a weaker gizzard than those that eat plants and seeds. It is to be noted that the gizzard has a grinding motion and crushes the food, and to facilitate this action many birds swallow small stones. The intestines are smaller and simpler than those in mammals, but in the main all the organs, like the kidneys, gall bladder, and other vital organs, are common to them.

Birds possess all the senses, more or less fully developed. The senses of touch and taste are quite dull in all the birds, while the senses of sight and hearing are highly developed. Birds of prey possess a strong sense of smell. Many birds have no

Courtesy U. S. Fish and Wildlife Service

BIRD BANDING

To facilitate the study of the migratory habits of birds, large numbers of them are banded (as the female mallard above). A small aluminum ring or band, bearing an identification number and the address of the bird's starting point, is clamped about its foot, thus enabling the finder to determine the approximate route of migration song, but all are known to be able to make a noise or cry. Only the male birds possess the power of song, but females have ability to call other birds. When domesticated, the song is beautified and enlarged, but birds of the finest plumage are not the best singers; their richness in dress is compensated for by the song in the plainer birds. Many birds migrate in the spring to the colder regions and return in autumn, but there are also summer birds of passage.

In nest building there is a wide range of difference. Some lay their eggs on the warm sand of the seashore or on desert oases, while others build nests in trees and bushes, or burrow in the banks of rivers or oceans. The eggs are hatched by incubation; that is, by sitting on them and keeping them warm until young birds are produced, but there are some birds that lay their eggs to be hatched by the warmth of the sun or the heat generated by decaying vegetation. The mother bird guards the nest at short range, while the males are seen at some distance watching the enemy. Many kinds of young birds are able to leave the nests and gather food for themselves shortly after hatching, but the young of some species are fed for days and even weeks.

For the purpose of study there are various divisions of birds, but the following seven are those commonly given:

1. *Climbers* (*scansores*) are birds that climb, such as the woodpeckers, toucans, parrots, and cuckoos. Their power of flight is not well developed, but they possess feet and toes well adapted for climbing and moving about on the limbs of trees.

2. *Perchers* (*insessores*) are the birds that perch habitually among trees. This class of birds includes all the birds of song and most birds that live in trees. It constitutes the most numerous order.

3. *Raveners* (*raptores*) are birds of prey. They have strong, curved beaks with sharp edges. Their feet possess claws with sharp hooks, useful in catching and destroying other animals, and their wings are well developed for flight. This class includes such birds as owls, vultures, hawks, and eagles.

4. *Runners* (*cursores*) include the emu, ostrich, and cassowary. Their wings are rudimentary and useless for flight, while their legs are powerful. They are otherwise distinguished by their breastbone being without a keel and their hind toes wanting.

5. *Scratchers* (*rasores*) embrace the domestic pigeons, fowls, and pheasants. The bill is short and thick, the legs are strong and large, and the feet are suitable for scratching.

6. *Swimmers* (*natatores*) are web-footed birds, as gulls, geese, swans, and ducks. The feet are webbed; that is, the toes are connected by membrane and formed for swimming. Most species have flattened bills, and are expert divers.

7. *Waders* (*grallatores*) include the snipes, herons, sandpipers, cranes, and many others. Their legs are long and destitute of feathers above the heel, and their toes are usually half webbed. The bill is long and slender, adapted for fishing under water.

Bird Sanctuary, a refuge for wild birds where hunting is prohibited, providing places for breeding and for rest during migration. The Fish and Wildlife Service, created in 1956 in the U.S. Dept. of the Interior (replacing an independent service established in 1940), maintains about 275 national wildlife refuges, of which about 200 are devoted to waterfowl. In connection with the refuges, the service conducts research on the life histories, habits, distribution, and diseases of the species sheltered. The first national wildlife refuge was created at Pelican Island, in Florida, in 1903. Others are operated in conjunction with the National Parks, such as Everglades National Park in Florida. The U.S. service cooperates with the Dominion Wildlife Service in Canada, which also operates extensive bird sanctuaries. Various states also maintain bird sanctuaries, as do the Audubon Societies and many other private organizations. See also *Wildlife.*

Birds' Nests, the habitations of birds, in which they lay their eggs and hatch their young. In the construction of nests birds differ largely, from the rude and simple to the wonderful and skillful. Two classes of birds are usually recognized by writers: those that build their nests in trees and structures above the ground and those that build in cliffs or on the ground. Nearly all birds that swim and dive, and those that live along the shore, build their nests on the ground. Some birds lay their eggs on rocky cliffs or in the sand on the shore of the sea or inland lakes. The nighthawks and whip-poor-wills lay their eggs on dry leaves or on the roofs of houses. Many water birds build nests by means of sticks and leaves entwined among the reeds of swamps. This class usually feather their nests with the down taken from beneath their breast.

Writers have divided birds into different classes, using the kind of nests they build as a basis for classification. Such birds as the canary are called *felt-makers,* because they weave their material much like the fibers of felt are arranged. Some of the birds in India are classified as *tailors,* because they sew leaves together and build their nests in a pouch-like formation, hanging downward. Many species of birds, including the mocking bird, red-winged blackbird, and many others, are classified as *basket-makers,* because they construct basket-shaped nests that resemble the seed-vessels of plants in which they build, to deceive those who chance to visit the locality in search of eggs. *Platform builders* are such as the pigeon and eagle, which arrange platforms on the branches of trees to utilize them for the nests and for perching. *Mining birds* dig holes in the ground, or use the holes made by other animals, for the purpose of making nests. A small owl of the western plains is a good example of this class. It lives with prairie dogs and hatches its young in their holes and is closely associated with snakes. *Mason birds* build nests in cliffs and under the eaves of houses, constructing them of mud in the shape of a flask. *Carpenter birds,* such as woodpeckers, chop holes into the trunk or limbs of trees and build their nests in airy tunnels. *Ground builders* make their nests in small holes in the ground, usually under a tuft of grass or near a large stone. The subject of birds' nests is an interesting study. However, it is remarkable that one class of bird, no matter where found, constructs the same kind of nest, and that there is no change or improvement in the construction. Cuvier asserted that birds known to the Egyptians and Babylonians built the same kind of nests as those of today. Many birds can be induced to nest in small houses constructed for them and conveniently located.

Birds of Passage, the birds that migrate from warmer to colder climates and from colder to warmer climates; these include two classes, known as *winter birds of passage* and *summer birds of passage.* Winter birds of passage migrate in the spring toward the polar regions to breed and return toward the warmer zones in autumn, while the summer birds of passage pass toward the colder regions in the fall and return toward the warmer in the spring. These classes vary according to the different latitudes. The wild duck and the goose are familiar winter birds of passage, while the robin is a good example of the other class. Among the birds that do not migrate may be mentioned the quail, grouse, and snowbird.

Bird Watching, the practice of observing and identifying birds, migratory and otherwise. As a hobby, bird watching has had a spectacular growth in the U.S. since the early 1930's, as a result of publication of excellent guidebooks which simplify bird identification in the field. It is an inexpensive hobby, requiring only a good field guide and a pair of binoculars. There is no "closed season"; the bird watcher can enjoy his sport at any time of the year, although the spring and fall migrations afford the greatest opportunities for seeing a large variety of birds. It can be practiced almost anywhere—in the wilderness, on farms, or in cities; more than 100 species of birds have been reported in Central Park in New York City. Also, it can be practiced by almost anyone; children and elderly adults are among its enthusiasts.

Bird watchers fall into a number of categories, and it is difficult to estimate their number. Great Britain and some of the Scandinavian countries are believed to have the greatest number of practitioners. In the U.S. the total is put at several million, with the greatest concentration in Massachusetts; the state Audubon Society alone has *ca.* 10,000 members. Nationally, the Audubon Junior Clubs have enrolled more than 9,000,000 members since their founding in 1910. Of these bird watchers, some may merely throw out a few crumbs to the birds in winter; others make detailed observations of their habits and behavior and write technical articles and books about their findings.

To the beginner, bird watching is identification alone, and many enthusiasts never go beyond this stage. Others, more advanced in the hobby, study the life histories, behavior, or possibly the migration of birds, and such amateurs have made important contributions to ornithology (the science that deals with birds).

Another phase of bird watching is the trapping, banding, and releasing of birds in order to study their migration habits. Birdbanding requires Federal and state permits, more than 2,000 of which are currently in effect. For illustration, see *Birds.*

Bird watchers also take part in cooperative projects, of which the Christmas Bird Count is the largest. It was originated by Frank M. Chapman in 1900, with 27 observers. Currently some 6,000 men, women, and children brave the winter weather to make a count of birds during a single day. Tabulated over a period of years, these counts give an interesting picture of the fluctuations of winter-bird populations. Other coopera-

Courtesy National Audubon Society

BIRD WATCHERS

The sport appeals to young and old alike tive projects, also sponsored by the National Audubon Society, are the annual breeding-bird census, as well as the winter-bird population studies. The most recent addition to the projects through which amateurs can contribute to scientific knowledge is lunar bird study, which involves observations of birds through 20-power telescopes as they fly across the face of the moon during spring and fall migrations. This project, sponsored by Louisiana State Univ., already has revealed interesting facts; *e.g.*, that bird migration is heaviest during the period between 11 P.M. and midnight, and that most birds migrate singly rather than in flocks.

Many bird watchers increase the ease and enjoyment of the hobby by attracting birds to their premises. The major means of achieving this is the planting of trees and shrubs for food and shelter, the building of bird houses and nesting trays for nest sites, and the fencing or other protection of the property to reduce danger from dogs and cats. In some instances, provision of water is an important aid.

The hobby of bird watching often leads young people to consider ornithology as a career. Most ornithology graduates go into teaching, museum work, or government positions; the field of wildlife management is broader but more specialized. There is a small but consistent demand for all-round naturalists who can take over nature-education jobs in national, state, and city parks, as well as with private organizations.

The largest general organizations for bird watchers and other nature hobbyists are the Audubon Societies, which are represented throughout the U.S. The major technical organizations are the American Ornithologists' Union, the Wilson Ornithological Club, and the Cooper Ornithological Club.

Birdwood (*bûrd'wŏŏd*), WILLIAM RIDDELL, 1ST BARON BIRDWOOD OF ANZAC AND TOTNES, British field marshal, born in Kirkee, Bombay Presidency, India, Sept. 13, 1865; died in London, England, May 16, 1951. A graduate of the Royal Military Coll. at Sandhurst, he was commissioned in 1883. After service in India he was assigned to South Africa, where he served in the South African (Boer) War (1899-1902) under Lord Kitchener, whose military secretary he became. At the outbreak of World War I, Birdwood became commander of Australasian troops. He fought in the Gallipoli campaign from April to August 1915, directed the British withdrawal after the Dardanelles could not be forced, and later served on the western front. From 1920 to 1924 he commanded the Northern Army in India; in 1925 he was made field marshal, and from then until 1930 he was commander in chief of the Indian Army. He was master of Peterhouse, Cambridge Univ. (1931-38) and in 1941 published an autobiography, "Khaki and Gown."

Birkbeck (*bûrķ'bĕķ*), GEORGE, physician and educator, born in Settle, Yorkshire, England, Jan. 10, 1776; died in London, Dec. 1, 1841. He received a medical degree at the Univ. of Edinburgh in 1799 and taught at the Andersonian Institution in Glasgow. Becoming interested in education for workingmen, he gave lectures on science and was instrumental in establishing (1823) the Glasgow Mechanics' Inst. In the same year he helped to found the London Mechanics' Inst., which later was named Birkbeck Coll. and in 1920 became part of the Univ. of London. He was also a founder (1827) of University Coll., London.

Birkenhead (*bûr'ķẹn-hĕd*), a seaport in Cheshire, England, on the estuary of the Mersey River, opposite Liverpool. A railway and shipping center, the city has principal industries of shipbuilding and the manufacture of machinery. Birkenhead is connected with Liverpool by ferry and by a tunnel more than 2 m. long. The city is the seat of St. Aidans Coll. Birkenhead dates from the 12th century, but its importance as a trade center developed with the building of shipyards in the 19th century. The Confederate ship *Alabama* was built here (see *Alabama Claims*). Birkenhead was incorporated in 1877 and became a county borough in 1888. Population, 1951, 142,392.

Birkenhead, FREDERICK EDWIN SMITH, 1ST EARL OF, lawyer and statesman, born in Birkenhead, Cheshire, England, July 12, 1872; died in London, Sept. 30, 1930. A graduate of Wadham Coll., Oxford, he studied law and established a practice first in Liverpool and later (1908) in London. He was elected to Parliament, where he served from 1906 to 1919, building a wide reputation as a political orator for the Conservative party. He outspokenly opposed the Parliament bill of 1911, which ended the veto power in the House of Lords, and the Irish Home Rule bill in 1914. He served as a member of the privy council (1911), as attorney general (1915), as lord chancellor (1919-22), and as secretary of state for India (1924-28). He was knighted in 1915, raised to the peerage as Viscount Birkenhead in 1919, and made an early in 1922.

Birmingham (*bûr'mĭng-hăm*), a city and port of entry in north central Alabama, largest city in the state, seat of Jefferson County, 95 m. N.W. of Montgomery. It is served by several railroads, including the Atlantic Coast Line, Illinois Central, and Seaboard Air Line R.R.'s. The municipal airport is 5 m. N.E. of the city.

The city has an area of 68.19 sq. m. and lies in a valley about 600 ft. above sea level, in the heart of a section rich in minerals, including iron ore, coal, and limestone. Port Birmingham, on the nearby Warrior River, provides water access

Courtesy Birmingham Chamber of Commerce

BLAST FURNACE IN BIRMINGHAM, ALA.

Iron and steel are the heart of the city's economy

to the city from the Gulf of Mexico. There are more than 65 public parks, including Woodrow Wilson Park in the business district, near which are grouped the principal public buildings; East Lake Park; and the state fairgrounds. In Vulcan Park, on Red Mt. overlooking the city, stands a cast-iron statue of Vulcan, which was built for exhibition at the St. Louis Exposition in 1904; in 1935 it was erected in Vulcan Park as a symbol of the spirit of the city. A Veterans Admin. hospital was opened in the city in 1953.

Called the Pittsburgh of the South, Birmingham is a major center of the steel and iron industry. Other products include fabricated metal goods, coal, chemicals, builders' hardware, paper products, freight cars and parts, and roofing and siding materials. Agricultural products of the surrounding area include cotton, poultry, and cattle. Birmingham (value added by manufacture, 1958, $349,228,000) is the center of a standard metropolitan statistical area (pop., 1960, 634,864) which covers all of Jefferson County, including the city of Bessemer.

The city's more than 95 public elementary and secondary schools enroll more than 66,500 pupils annually. Institutions of higher learning include Birmingham-Southern Coll., Miles Coll., Howard Coll., Daniel Payne Coll., and the medical and dental schools of the Univ. of Alabama. Among cultural facilities is the Birmingham Museum of Art. Birmingham is also the site of St. Paul's (Roman Catholic) Co-Cathedral. The city has a commission form of government.

The site of Birmingham was first settled in 1813 by John Jones. In the ensuing years, the towns of Carrolsville and Elyton grew up, the latter becoming the county seat in 1819. The railroad reached the valley in the 1860's, and in 1870 Birmingham was founded by the Elyton Land Co. and named for its English industrial counterpart. It was incorporated and became the county seat in 1871.

In 1890 Birmingham had a population of 26,178. In a decade of phenomenal growth, the population increased from 38,415 in 1900 to 132,685 in 1910. In 1940 it was 267,583; in 1950, 326,037; in 1960, 340,887.

Birmingham (*bûr′mĭng-ạm*), a city and county borough in Warwickshire, England, *ca.* 110 m. N.W. of London, situated on a height 200 ft. to 600 ft. above sea level. Called the Second City of Great Britain, it is one of the world's great industrial centers and the cultural heart of a wide area of the Midlands. It is served by several railroads and has an airport at nearby Elmdon.

With an area of *ca.* 80 sq. m., Birmingham is situated in a rolling countryside close to many places of historic interest. Stratford-on-Avon, the birthplace of William Shakespeare, is *ca.* 20 m. to the southeast, near Royal Leamington Spa and the historic town of Warwick. Among notable buildings in the city are the Town Hall (1834-50), designed by Joseph Hansom, inventor of the hansom cab, and John Welch; the Council House (1874-81); the Cathedral (Church of St. Philip), a Palladian building noted for its stained-glass windows by Sir Edward Burne-Jones; St. Martin's Church (rebuilt in 1872-75); and the Roman Catholic Cathedral (St. Chad's). Birmingham's more than 100 parks, which cover more than 4,000 acres, include Cannon Hill, with a garden designed for students of botany; Lightwoods Park; Warley Park; and the Botanical Gardens.

BIRMINGHAM, ENGLAND

St. Martin's Church facing the Bullring market place

Courtesy British Information Services

Birmingham's diversified industrial activity covers a range of 1,500 industries. Chief among them are the manufacture of automobiles, motorcycles, and bicycles; electrical equipment; jewelry; machine tools; railway coaches; toys; and chemicals.

Birmingham is also an important educational center, the site of Birmingham Univ., Wesleyan Theological Coll., and the Roman Catholic Birmingham and Midland Inst. Its cultural facilities are extensive, including the Corporation (municipal) Art Gallery and Museum, the Museum of Science and Industry, and Barber Inst. of Fine Arts. The City of Birmingham Symphony Orchestra has its home in the Town Hall, site of the first performance of Mendelssohn's "Elijah" (1846), under the composer's direction. The Central Library contains a Shakespeare collection of *ca.* 35,000 volumes, among the largest in the world. Aston Hall is a reconstructed 17th-century mansion, and Blakesley Hall is a yeoman's house of the 16th century. The city is also a center for sports, such as football, cricket, horse- and greyhound-racing.

Settlements on the site of Birmingham have been traced to Roman times. Up to the 13th century, the town was a market center for an agricultural region. By the 16th century, it had grown into an industrial community, specializing in metal manufacturing. During the Civil War, in 1643, it was sacked by the Royalists but soon regained its stability. The 18th century saw the city's greatest growth with the development of the Industrial Revolution. Birmingham was established as a borough in 1832, incorporated in 1838, and became a city in 1889. It suffered much damage in World War II. Population, 1951, 1,112,340.

Birnam (*bẽr′nạm*), a hill and village in Perthshire, Scotland, *ca.* 12 m. N.W. of Perth. The hill, 1,324 ft. above sea level, affords a fine view of the Tay River and valley. Formerly it was covered by a forest made famous by Shakespeare as Birnam Wood, in "Macbeth."

Birney (*bûr′nĭ*), JAMES GILLESPIE, politician, born in Danville, Ky., Feb. 4, 1792; died in Perth Amboy, N.J., Nov. 25, 1857. A lawyer, he was a strong supporter of the abolition of slavery, and against violent opposition he established (1836) an antislavery newspaper, the *Philanthropist,* in Cincinnati, Ohio, which became highly influential. In 1837 Birney went to New York, and in the following year he became secretary of the American Anti-Slavery Society. In 1840 and 1844 he ran unsuccessfully for the Presidency on the Liberty party ticket.

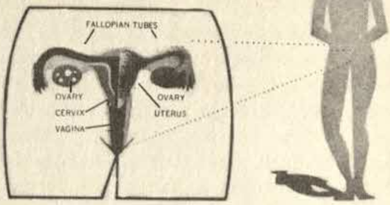
Birobidjan (*bĭr-ô-bĭ-jän′*), or BIROBIDZHAN, or BIRO-BIDJAN, the Jewish autonomous oblast (region) in the U.S.S.R., bordered on the south by Manchuria and on the northeast by the Far Eastern Soviet Republics. Along the southern border runs the Amur River, whose tributaries, the Bira and Bidja Rivers, water the territory. Birobidjan, with an area of 15,000 sq. m., was set aside in 1928 by the Soviet government for Soviet Jews who desired a home state within Russia. Within six years, the pioneering work had been completed, and efficiently organized settlements had been established in the area which had formerly been virtually wild and unpopulated. On May 7, 1934, Birobidjan assumed the status of an autonomous region, with self-governing powers, and a representation of five delegates in the Council of Nationalities of the U.S.S.R.

Because the Trans-Siberian Express covers over 200 m. of Birobidjan territory, the region's opportunities for a growing commerce are excellent. The fertile soil makes agriculture a rewarding occupation. Wheat, oats, potatoes, cabbage, soy beans, and rice are all grown profitably. A large amount of honey is produced. The region is rich in natural resources, which include coal, iron ore, gold, graphite, marble, tin, and magnesite. Timber, pelts, and fish add to the natural wealth. Birobidjan, the capital and industrial center, is located near the northeastern border. Other towns include Kuldur, Radde, Amurzet, Stalinsk and Golovino. Population, 1939, 109,000; 1945, *ca.* 175,000.

Birth (*bẽrth*), the action of delivering, by a female, of a living offspring into the world, both in humans and all animals of the mammalian class. The human female usually gives birth to, or delivers, a single infant, although multiple pregnancies and resultant multiple deliveries are not uncommon. Statistics reveal that one in 80 deliveries produces twins, about one in 6,500 triplets, and about one in 515,000 quadruplets. There are only about 35 authentic cases on record of quintuplets, the most famous of these being the Dionne quintuplets (*q.v.*), all girls, born in 1934, all of whom lived through their teens. Heredity (*q.v.*) is important in multiple pregnancies. It is known that several succeeding generations of women in the same family have produced one or more sets of twins or triplets. Medical history also indicates that the inclination to multiple births (meaning more than one child born at the same time) is also transmitted through the male. In the commonly known animals delivery of a single offspring is the rule, but twins or triplets are common in the horse, cow, sheep, and goat, and related species, while litters of more than two or three are common in the dog, cat, rabbit, fox, pig, and similar animals, both wild and domestic. In the apes and monkeys single birth is usual, with twins and triplets occurring probably in about the same ratio as the

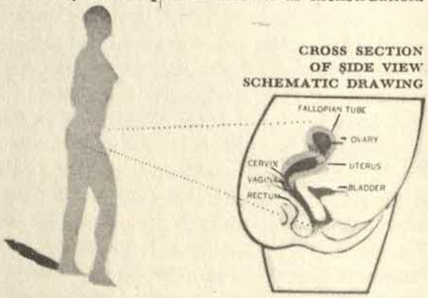
FEMALE REPRODUCTIVE SYSTEM

CROSS SECTION
OF FRONT VIEW
SCHEMATIC DRAWING

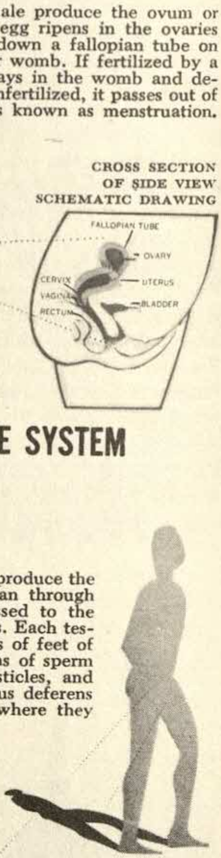


The ovaries of the female produce the ovum or egg. Usually only one egg ripens in the ovaries each month. It passes down a fallopian tube on its way to the uterus or womb. If fertilized by a male sperm, the egg stays in the womb and develops into a baby. If unfertilized, it passes out of the body in the process known as menstruation.

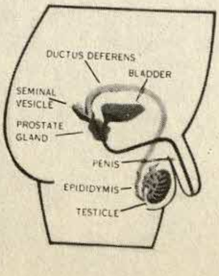
CROSS SECTION
OF SIDE VIEW
SCHEMATIC DRAWING



MALE REPRODUCTIVE SYSTEM



The testicles of the male produce the sperm or seed. The organ through which the sperm is passed to the female is called the penis. Each testicle consists of hundreds of feet of tiny coiled tubes. Millions of sperm are produced by the testicles, and carried through the ductus deferens to the seminal vesicles where they are stored.



SCHEMATIC DRAWING

human. Twins and triplets, etc., are more likely to occur in healthy women in the temperate and colder climates, especially those fertile women who have borne several children previously. Twins may be *fraternal* or *identical.* Fraternal twins are developed from two separate female ova (egg cells) fertilized at the same time by two individual male sperm cells and developing normally together in the female uterus (womb); while identical twins develop from a single fertilized female ovum and are necessarily of the same sex and closely resemble each other. Fraternal twins may or may not be of the same sex, and do not resemble each other more than any other children of the same parents.

REPRODUCTION. An embryo (fertilized egg cell or ovum—the product of conception up to about the fourth month of pregnancy) reaches maturity (physical and physiological development to an extent sufficient for existence without direct contact with the mother) in the human in nine calendar months or 10 lunar months, the average being 277 to 280 days, at which time normally hair, nails, facial features, and other parts of the infant body are sufficiently developed to make it relatively a miniature of the adult. The average normal full term (nine months) infant weighs about 7 to 7½ pounds and is about 19 in. long; however, these figures vary somewhat with race and climate. When the living child is at term in the womb of the mother, certain physiological reactions take place in the mother whereby the womb starts to contract strongly in a rhythmical manner with frequently severe pain, hence the terms *labor,* and *labor pains,* are applied to this part of the reproductive process. As labor progresses, requiring several hours, varying from less than one hour to 18 hours or more depending on the size of the baby, the size and health of the mother, and the position of the baby, the womb contracts more strongly, the mouth of the womb (cervix) dilates and becomes very thin, the vagina becomes distended, the body of the infant is forced downward and outward in a spiral movement, and in the last few moments is finally completely expelled to the outside world, following which the umbilical cord (cord of blood vessels between the child and the placenta, or after-birth) is cut and tied, and the new-born is then, physiologically at least, on his own. Soon thereafter, the womb again contracts strongly and becomes much smaller, expelling the placenta (commonly called the after-birth—really a cake of blood vessels and tissue attached to the inside of the womb through which sustenance was provided for the growing fetus from the mother, and waste products removed), thus completing the birth process.

An *operative birth,* or delivery, is a birth in which the natural processes above described are aided by the physician, frequently by use of instruments called forceps, applied to the infant's head as an aid in extraction, especially when complications may be present endangering the life of either the mother or the infant, or labor is prolonged and the mother fatigued. *Caesarian birth,* or *Caesarian section,* is operative delivery of the infant through an incision through the maternal abdomen directly into the womb, in cases of emergency, of too large an infant or abnormal structure of the mother preventing delivery in the normal manner. *Still birth,* birth of a dead child, or of a child dying in the process of or soon after delivery. *Premature birth,* birth of a living child after the seventh and before the ninth month of pregnancy. *Abortion* (*q.v.*) is expulsion of the fetus (*q.v.*) before the third month of pregnancy, and miscarriage is expulsion of the dead fetus after the third and before the seventh month of pregnancy.

Birth Control (*bērth cŏntrōl′*), the practice of contraception among married couples for medical, economic, and social reasons, acceptable to the physician, depending on the laws of the state, community or religious belief. Birth control was first discussed by the Rev. Thomas Robert Malthus in 1803, when, in his "Essay on the Principle of Population," he postulated that population increases in geometric progression and that food increases in arithmetic progression; hence, according to his view, a point would one day be reached where the earth could not sustain its people. His solution of the problem was to limit population.

The modern movement started with Mrs. Margaret Sanger in 1912. The opposition to the movement is centered largely in various religious bodies, who hold that birth control is contrary to spiritual and fundamental teachings.

Birth Palsy (*bērth pâl′zĭ*). See *Paralysis.*

Birth Rate (*bērth rāt*), a statistical term used in reference to population changes or trends in a given nation, state, local area, or racial group. A commonly used basis is the number of live births per 1,000 people per year. See *Vital Statistics.*

Birth-Stones (*bērth-stōnz*). See *Stones, Precious.*

Bisbee (*bĭz′bē*), a city of Arizona, in Cochise County, 10 m. from the Mexican border, on the Southern Pacific R.R. It is surrounded by a rich agricultural and copper-producing country. Population, 1920, 9,205; in 1950, 3,801.

Biscay (*bĭs′kā*), BAY OF, a vast inlet of the Atlantic Ocean on the western coast of Europe, forming the eastern boundary of France from Brest to the Pyrenees, and the northern boundary of Spain from Irun to Cape Ortegal. Its French coast is low, but the Spanish coast rises in rocky cliffs. Navigation is dangerous, owing to storms and breakers. The tide sweeps to a height of 40 ft. The waters from the Garonne and Loire flow into it. On its shores are numerous seaports, including Nantes, Brest, Bordeaux, Bilbao, and Gijon.

Biscay, or VIZCAYA, a province of Spain, in the northern part, one of the so-called Basque provinces. It has an area of 836 sq. m. The surface is mountainous. Bilbao is the capital and largest city. Other cities include Orozco and Bermeo. Population, over 300,000. See *Basques.*

Biscuit (*bĭs′ḳĭt*), a kind of bread formed into small cakes, either fermented or unfermented, and made chiefly of wheat and rye flour. Many kinds of biscuits are made in large bakeries for the trade and sold on the market, both in bulk and in small packages designed for household use. The work of kneading, cutting, and stamping is done almost exclusively by machinery, and an oven serves to turn out about 2,000 pounds of biscuit in a day of nine hours. Biscuits are baked so they become hard and dry, hence may be kept without spoiling for a long time. *Sea biscuits* are made of flour, water, and salt and keep easily for two years. The biscuits of the market are made chiefly of flour, butter, eggs, soda, and salt, the proportions of the ingredients used depending upon the kind and quality desired, and in making sweet biscuits sugar and flavoring are used. To make soft biscuits larger proportions of sugar and butter are required. *Meat biscuits* are made of wheat flour and the soluble parts of meat.

Bisexual (*bī-sĕḳ′shŏŏ-ạl*), term describing *1*) beings having the sexual organs of the male and female, like certain animals of lower orders; *2*) the hermaphrodite in human development; or *3*) human beings (either male or female) expressing a sexual desire toward both sexes.

Bishop (*bĭsh′ŭp*), a title applied to the highest order of the clergymen in the Christian Church. In the Roman Catholic, Protestant Episcopal, and Greek Catholic Churches bishops claim apostolic succession. In the Methodist Episcopal and other churches less formal dignity is maintained and no claim is made to apostolic succession. In Great Britain the bishops of the Church of England are called lord bishops. Two of the archbishops and a number of the bishops of Wales and England have seats in the House of Lords. The general duties of bishops vary greatly in different denominations, but usually include the power to appoint clergymen to churches, the dignity to preside at conventions of the clergy, and oversight over the churches of the clergy within the diocese.

Bishop, WILLIAM AVERY, Air Marshal of Canada, born in Owen Sound, Canada, Feb. 8, 1894; died in Palm Beach, Fla., Sept. 11, 1956. While attending the Royal Military Coll., Kingston, Canada, Bishop was in the cavalry, but when World War I broke out, he was sent overseas with the Canadian Expeditionary Forces and transferred to the air force. By 1917 he had earned an enviable reputation as a fighter pilot; by the end of the war he was credited with destroying 72 German planes. After the war, he lived in England for 10 years, returning to Canada (1931) to enter business, becoming director of the English Electric Co. of Canada, Ltd., and vice president of the McColl-Frontenac Oil Co. He was later a consultant for the oil firm. Bishop was made an air marshal in 1938 and was in charge of recruiting for the R.C.A.F. in 1940-44.

Bismarck (*bĭz′märḳ*), capital of North Dakota, county seat of Burleigh County, on the Missouri River. It occupies an elevated site on the Minneapolis, St. Paul & Sault Ste. Marie and the Northern Pacific R.R.'s. The chief buildings include the high school, the county courthouse, the state capitol, the state penitentiary, the state library, and the state Memorial Building. It is surrounded by a fertile region and is a market for large quantities of wheat, oats, potatoes, and merchandise. The industries include flour mills, machine shops, and grain elevators, lignite coal, tile brick, gravel, and bottling. It was settled in 1873 and became the capital of the state in 1889. Population, 1950, 18,640.

Bismarck Archipelago (*är-ḳĭ-pĕl′ȧ-gō*), a group of islands in the Pacific Ocean, about 56 m. E. of New Guinea. The principal islands are New Britain, New Ireland, Lavongai (late New Hanover), Duke of York, and Admiralty. Copper and trepang are exported, and the trade in fruit and merchandise is important. A German protectorate after 1884, Australian forces occupied the islands at the start of World War I, in 1914, thus bringing them under British control. The Japanese invaded them in January 1942, but were expelled again in 1944, during World War II. Population, *ca.* 150,000.

Bismarck-Schönhausen (*bĭs′-märḳ-shĕn-how′zen*), OTTO EDUARD LEOPOLD, PRINCE VON, one of the greatest European statesmen of the 19th century, born at Schönhausen, in Brandenburg, Germany, Apr. 1, 1815; died July 30, 1898. He was a descendant of ancestors whose lineage is traced back to the middle of the 16th century. His education was received at Göttingen, Berlin, and Greifswald. He first became known in 1847 as a member of the Prussian Parliament, where he took an active part as an ultraroyalist. He was appointed Prussian member of the German Diet at Frankfort in 1851, from which his diplomatic career dates. His zeal for the enlargement of Prussian power led to a rupture with Austria at the time that country became involved in a war with Italy and France. In 1859 he became minister to St. Petersburg, when he strengthened the relations between Russia and Prussia, and in 1862 was transferred to Paris. While at Paris he made an official visit to London, where he met the leading English statesmen of his time. From Paris he was recalled to take charge of the portfolio of minister for foreign affairs, and the presidency of the cabinet. The lower house refused to pass Bismarck's bill for the reorganization of the army, which caused him to dissolve it at once, and he governed without a budget during four succeeding sessions. Public excitement was at the greatest height of intensity when the Schleswig-Holstein question diverted the strain, and he succeeded in adding the province to Prussia. Soon after new complications caused the Seven Weeks' War with Austria, which ended with Prussian triumph at the Battle of Königgrätz in 1866, and was followed by the reorganization of Germany, under the guiding spirit of Bismarck and the leadership of Prussia. When Prince Leopold of Hohenzollern was proposed for the throne of Spain, the unfriendly feeling between Germany and France was intensified and brought on the war of 1870-71. After the victories of the German armies, Bismarck dictated the terms of peace in the Treaty of Frankfort, May 10, 1871, by whose provisions Germany recovered Alsace-Lorraine and received a cash indemnity of $1,000,000,000 in gold.

PRINCE OTTO VON BISMARCK

In 1871, immediately after the establishment of the new German Empire, he was created prince and chancellor. His policy having been vindicated, he directed his attention to the enlargement of the army and navy, codification of the laws, reformation of coinage, civil reform, the introduction of a protective tariff, and the state control of railroads. He resigned the offices of prime minister and chancellor in 1890, owing to a divergence between him and Emperor William II. He was presiding officer at the Berlin Congress in 1878, and of the Congo Conference in 1884. The occasion of his departure from Berlin caused a great popular demonstration, which gave evidence of his intense popularity among the people. On Mar. 26, 1895, he was visited by Emperor William II at his own home in Friedrichsruhe on the occasion of his 80th birthday. Owing to his wisdom in building a great empire from a number of scattered states, and exercising a lasting influence on the politics of Europe, he was called *Iron Chancellor*.

Bismuth (*bĭz′mŭth*), a brittle metal of a reddish-white color and crystalline texture. It is somewhat harder than lead and can be reduced easily to powder when cold by means of a hammer. In a native state it frequently consists of crystallized rhombs, but also exists with other metals. It is useful in making printers' type, ink, and medicines, and in assaying gold and silver by cupellation. A compound of three parts of tin, five of lead, and eight of bismuth is known as *fusible metal*. The medical properties of bismuth are tonical and antispasmodic.

Bison (*bī′s′n*), the name of a kind of wild cattle found in Europe and North America, and sometimes incorrectly called *buffalo*. The European bison, or *aurochs*, is now nearly extinct, being confined to parks and in a wild state to the forests of the Caucasus; the total number now living is thought not to exceed 800. The American bison existed in large numbers in almost the whole of North America, but was most numerous in the Mississippi Valley and the great plains of Central Canada. Herds of tens of thousands roamed across the plains, usually traveling in solid columns, traces of their tracks still remaining in the sod on the Western prairies. They grazed upon the plains and traveled to watering places and alkaline licks, which is evidenced by the old trails which stretch for miles over hills and through valleys. They were one of the main sources of food supply for the Indians, and served a valuable purpose when the transcontinental railroads were in process of construction, since they were a prolific source of wholesome food for the workmen. The animal attains a height of about 6 ft., has short horns, a large hump back of the head formed of muscles, and shaggy hair of a dusky-brown color. It lives on grass, the bark of trees, and brushwood. Full development is reached at six years, and it attains to an age of 35 years. Only a few hundred still remain in the wild state, and these are protected by the government in parks of the Rocky Mts. A small remnant of the so-called *wood buffalo* has survived in the forests of Great Slave Lake. However, a number of bison ranches for the purpose of rearing them have been established in various sections. The skins of these animals are very valuable, while the hump is prized for its rich and delicate flesh. The small herd in

Courtesy Brown Bros., N. Y.

BISON

Yellowstone National Park is slowly increasing. Bison, when tamed, are peaceful and docile, but their number and strength made them a terror to all other animals in the early history of America.

Bissagos (*bĭs-sä′gôz*), or BIJUGA ISLANDS, a group of small islands near the west coast of Africa, opposite the mouth of the Rio Grande. They are of volcanic origin and inhabited by Negroes. Orange and Bulama are the chief islands, and Bulama, situated on the latter, is the leading town. Maize and fruit are cultivated, and goats and cattle are reared. These islands were discovered by the Portuguese, who made a settlement on Bissao, one of the group. They are governed as a dependency of Portuguese Guinea. Population, *ca.* 3,750.

Bissell (*bĭs′ẹl*), WILSON SHANNON, politician, born in Rome, N.Y., Dec. 31, 1847; died in Buffalo, Oct. 6, 1903. He was graduated from Yale in 1869 and took up the study and practice of law in Buffalo, joining a firm of which Grover Cleveland was also a member. He was attorney in many cases involving railroad litigation. In 1893 he became Postmaster General of the Cabinet of President Cleveland, resigned in 1895 to resume the practice of law, and in 1902 was made chancellor of the Univ. of Buffalo.

Bithynia (*bĭ-thĭn′ĭ-ȧ*), an ancient country of Asia Minor, separated from Europe by the Sea of Marmora and the Strait of Constantinople, then known respectively as the Propontis and Thracian Bosporus. It extended east to Paphlagonia, and contained the cities of Prusa Heraclea, Chalcedon, Nicomedia, and Nicaea. The Persians annexed it in 543 B.C., but it became an independent kingdom in 278 B.C. under Nicomedes I. Prusias II was King of Bithynia at the time of the Punic Wars, when Hannibal sought refuge at his court. The Romans made it a province in 74 B.C., and it was governed by Pliny the Younger. In 1298 it was conquered by the Turks, and the seat of the Turkish government was at Prusa for many years.

Bittern (*bĭt′tẽrn*), the name of several wading birds of the heron family, common to America, Africa, and Eurasia. They attain a length of 30 in., and the wings when extended, measure about 45 in. Their color is yellowish-brown with bars and spots of black. They frequent low, marshy districts, remaining at rest during the day and coming out at twilight to seek insects, reptiles, fish, and small quadrupeds for food. They are remarkable for their ability to stand on one leg, or hold their heads in the same position for several hours. The male produces a curious bellowing cry, which booms like a drum and may be heard fully a mile.

Bitternut. See *Hicḳory.*

Bitterroot (*bĭt′tẽr-ro͞ot*), an American plant found extensively in the Rocky Mts., both in Canada and the U.S. It has an edible root, sometimes called *tobacco root,* and in cooking gives off an odor much like that of tobacco. The root is long and fleshy and from it grow a fleshy stalk and numerous leaves. The flower is solitary, beautifully colored, and remains open only during sunshine. The Bitterroot Mts. and the Bitterroot River were named from this plant, and the flower was adopted by Montana as the state flower.

Bitterwood (*bĭt′tẽr-wo͝od*), the name of several trees and shrubs native to Brazil and the West Indies, so named from the bitterness of their wood. The fruit is aromatic and the wood is used in making furniture, being valuable because insects do not attack it. The name is applied to a tree native to Jamaica, nearly allied to the quassia, the wood of which is used in medicine. See *Quassia.*

Bitumen (*bĭ-tū′mẹn*), a mineral pitch of vegetable origin remarkable for its odor and inflammability. It is secured both in a fluid and solid state, and consists of about 85 parts carbon and 15 parts hydrogen. The term is sometimes extended to include the hydrocarbons, as petroleum, naphtha, asphalt, and mineral tars. It is found more or less commonly in many parts of the earth, but the largest deposits of what may be classed as mineral pitch are in the vicinity of the Dead Sea. It is useful for building purposes to make floors, roofs, and arches water-tight, and in the construction of walks and pavements. The brick used in the walls of ancient Babylon were cemented with bitumen to increase their durability and solidity. See *Asphalt.*

Bituminous Coal (*bĭ-tū′mĭ-nŭs*). See *Coal.*

Bituminous Shale, a kind of clay found in the coal measures, so named from the carbon and volatile matter mixed with the clay. Large beds are quite common, and in some places the bituminous shales are used as fuel.

Bivalves (*bī′vălvz*), the general name of mollusks having their shells in opposite portions, which open by elastic hinges and are closed by muscles. Among the bivalves are the cockle, clam, mussel, and oyster. With few exceptions, they are marine animals, while a number of univalves, single-shelled mollusks, are common to the land. The fossil remains of bivalves indicate the depth and extent of the ocean in early geological ages, and show that bivalves existed in the earlier part of the age of invertebrates, the Silurian age.

Bizerte (*bē-zĕrt′*), a seaport of Tunisia, on a bay of the Mediterranean Sea, 38 m. N. of Tunis. It holds a commanding position as a fortified naval station at the narrowest part of the sea. The town, built upon the ruins of the Tyrian colony of Hippo Zarytus, became a Roman settlement, but was conquered by the Arabs in the 7th century. Captured by the Spaniards in 1535, it was later returned to the Tunisian beys, but fell into neglect until 1895, when a new port was completed. In World War II, Allied forces captured Bizerte on May 7, 1943, virtually ending Italo-German power in North Africa. Population, *ca.* 28,000.

Bizet (*bē-zĕ′*), ALEXANDRE CÉSAR LÉOPOLD, popularly known as GEORGES, composer, born in Paris, France, Oct. 25, 1838; died at Bougival, near Paris, June 3, 1875. He entered the Conservatoire at Paris when nine years of age to study piano, and afterward studied composition under Zimmermann and organ under Benoist. Subsequently he studied in Italy, where he began composing. His compositions belong to the romantic school, and include the operas "Carmen," *"La Jolie Fille de Perth," "Les Pêcheurs de Perles,"* and *"L'Arlésienne"* suites.

Björnson (*byĕrn′sŭn*), BJÖRNSTJERNE, poet, novelist, and dramatist, born in Kvikne, Norway, Dec. 8, 1832; died at Paris, Apr. 26, 1910. He studied at Christiana (now Oslo) and later at Copenhagen. His first publication, "Synnöve Solbakken" (1857), was followed by "Arne," "A Happy Boy," and "The Fisher Maiden," all tales of Norwegian peasant life. He became manager of the Bergen theater (1857) and of the Christiana theater (1865). In addition to writing poetry, dramas, and novels, he was a journalist, lecturer, and traveler. He was editor of the *Aftenbladet* in Christiana (1859), and of the *Norske Folkeblad* (1865-67). Active in the political and social life of his homeland, he lectured both there and in America which he visited in 1880. Among his many publications are the dramas "Sigurd the Bastard," "The Newly Married," "A Bankruptcy," and "The Editor," and the novel, "In God's Way." Many of his writings have been translated into almost every language. Björnson received the 1903 Nobel Prize for literature "in recognition of a noble devotion to poetic creation over a long period of years, distinguished by a rare purity of spirit and originality of conception."

Norwegian Official Photo

BJÖRNSTJERNE BJÖRNSON

(In foreground)

Black (*blăk*), HUGO LA FAYETTE, jurist, born at Harlan, Ala., Feb. 27, 1886. He studied law at the Univ. of Alabama and began practice at Birmingham in 1907. Meanwhile he took an active part in politics as a Democrat and was twice elected U.S. Senator (1927-39). During World War I he served with the artillery in France. President Roosevelt nominated him an associate justice of the Supreme Court and he began service Oct. 4, 1937, in spite of opposition on charges that he had been a member of the K.K.K. In 1941, Black's name was added to the Honor Roll of Race Relations by the Schomburg Collection of Negro Literature in the New York Public Library in recognition of the affirmative stand he has taken in civil rights cases before the Supreme Court.

Black, JEREMIAH SULLIVAN, jurist, born at the Glades, Somerset County, Pa., Jan. 10, 1810; died at York, Pa., Aug. 19, 1883. Largely self-educated, he entered a law firm in Somerset County at 17, and was admitted to the bar at 20. In 1842 he was elected district judge, and from 1851-57 he was a justice of the Supreme Court in Pennsylvania. President Buchanan made him Attorney General (1857), in which capacity he protected the government from unjust claimants of land grants in California, and held the opinion that the Constitution gives the government the right to prevent insurrections and the secession of a state. In 1860 he succeeded Gen. Cass as Secretary of State, and the following year retired from public office to practice law. He appeared before the Supreme Court in a number of important trials, among them the McCardle case (involving the military arrest of an editor for criticizing military authority and the Reconstruction policy) and another case, in which Black defended the right of trial by jury. After the Civil War he opposed the reconstruction of the Cenfederate states and was counsel for President Johnson in his impeachment trial.

Black, WILLIAM, novelist, born in Glasgow, Scotland, Nov. 9, 1841; died at Brighton, Dec. 10, 1898. He started as a newspaper reporter in Glasgow, and obtained a post on the *Morning Star* in London. In the Austro-Prussian War (1866) he served as war correspondent to the *Morning Star,* and afterward served on the editorial staffs of the *Daily News* and the *Examiner*. The scenes of most of his writings are laid in the Scottish Highlands. His best books include "A Daughter of Heth," "A Princess of Thule," "Judith Shakespeare," "White Heather," and "Highland Cousins."

Blackberry (*blăk′bĕr-y̆*), the name of a large bushy plant resembling the dewberry and raspberry, also called *brambleberry* because the bushes are armed with prickles. The fruit is sweet and luscious, and is used for jam, jelly, and preserves, is eaten as a dessert, and is made into blackberry wine. Astringent tonics derived from the berries are used in medicine. The fruit grows in the wild state, but it is greatly improved by cultivation. These plants are widely distributed in both hemispheres and thrive as far north as central Canada. They are propagated from suckers and root cuttings. New varieties are secured by planting the seed.

Blackbird (*blăk′bĕrd*), the name applied to a large family of birds of America and Europe, generally called *merle* in western Europe. The *crow blackbird* and the *rustycrow blackbird* are of the starling family and nest largely in trees. *Red-winged blackbirds* constitute a widely distributed species, ranging throughout southern Canada and the U.S. from Maine to the Pacific. They live in meadows, marshes, and swamps, where they nest and rear their young. In autumn they gather in flocks and frequent meadows and stubble fields in large swarms. The food of blackbirds comprises worms, berries, and insects. Blackbirds are a protection to orchards in that they devour insects, but they also eat fruits, such as cherries and grapes. A number of species were eaten by the American Indians.

Blackburn (*blăk′bûrn*), a manufacturing city of Lancashire, England, about 21 m. N.W. from Manchester. It is on the Leeds and Liverpool Canal and on several railways. The chief buildings include the town hall, St. Mary's Church, Draper's Hall, and the municipal offices. Corporation Park and Queen's Park are public grounds. The importance of Blackburn dates to the 17th century, when it began to manufacture large quantities of cotton goods. It has many cotton mills, and manufactures steam engines, hardware, clothing, and cotton machinery. Population, *ca,* 150,000.

Blackett (*blăk′ĕt*), PATRICK MAYNARD STUART, nuclear physicist, born Nov. 18, 1897. Educated at royal naval colleges and Magdalen Coll., Cambridge, he served in the British navy during World War I, emerging as a lieutenant. While at Cambridge he studied with Sir Ernest Rutherford (*q.v.*). In the early 1920's Blackett did special research on the cloud chamber, a device for observing and photographing radioactive particles, which had been discovered by C.T.R. Wilson (*q.v.*). Blackett's continued studies leading to improvement of the cloud chamber and his research on cosmic radiation won him the Nobel Prize in physics in 1948. During World War II he was one of Britain's leading advisers on the application of scientific methods to such matters as antiaircraft, naval, and submarine techniques. His book, "Military and Political Consequences of Atomic Energy" (1948), published in the U.S. as "Fear, War, and the Bomb," aroused a storm of controversy because it supported Russia's rejection of the U.N. plan for the control of atomic energy. In this book, Blackett also minimized the military importance of the atomic bomb.

Blackfeet (*blăk′fēt*), a tribe of Indians distributed more or less through the Rocky Mts. of Montana, Wyoming, and Canada, and classed with the Algonquins. In early history they constituted a powerful tribe, but were quite peaceful. In 1865 they became involved in trouble with Western miners, and for five years skirmishes cost numerous lives. At present they number about 5,000, of which about one-half are in the U.S.

Blackfish (*blăk′fish*), or TAUTOG, the name of a large fish common along the Atlantic coast, much valued as a food product. It is allied to the dolphin and somewhat resembles the perch. The skin can be slipped off like that of an eel. It is one of the leading food fishes of the Eastern market.

Black Forest (*blăk fôr′ĕst*), or SCHWARZWALD, a chain of mountains in Europe, located in Baden and Württemberg, where it stretches almost parallel with the Rhine for 90 m. It is the source of the Kinzig, Neckar, and Danube Rivers. The highest summit is Feldberg (*ca.* 4,900 ft.). Mineral products include iron, lead, cobalt, copper, and silver, and there are numerous mineral springs. There is a fine growth of timber, consisting mostly of pines on the foothills. The valleys are farmed, and the towns have various manufactures, including furniture, toys, wooden articles, and clocks. There is a considerable trade in merchandise and cereals. Railroads cross the Black Forest along the mountainsides and through the valleys.

Black Friday (*blăk frī′dĭ*), a term used to designate any Friday on which some great calamity occurred. In the U.S. the name applies to Sept. 24, 1869, when a financial panic was caused by speculation in gold in New York City, and to Sept. 18, 1873, when a similar panic commenced.

Black Gum (*blăk̦ gŭm*), or SOUR GUM, a species of forest trees of North America, known in some localities as *tupelo* and *pepperidge*. The branches are crooked and bear tufts of leaves at the ends, and the wood is tough but not durable. Hubs of wheels are made of the timber. The tree has been introduced in Europe for ornamentation.

Black Hawk (*blăk̦ hôk̦*), a celebrated chief of the Sac and Fox Indians, born in Kaskaskia, Ill., in 1767; died in camp on the Des Moines River, in Iowa, Oct. 3, 1838. At an early age he became a leader against the Cherokee and Osage tribes, and was made grand chieftain of the Sacs in 1788. In 1804 the Sacs and Foxes agreed to cede to the U.S. lands extending along the Mississippi River for an annuity of $2,000. The treaty was signed while Black Hawk was absent, and he repudiated it. In the War of 1812 he joined the British army with 500 warriors, but soon retired from the British service and was induced to sign the treaty previously repudiated. When the Sacs and Foxes, under Chief Keokuk, removed beyond the Mississippi in 1823, Black Hawk, with a part of the tribe, refused to emigrate. He attacked the white settlers but was defeated by Gen. Gaines at the head of a force of militia in 1831, and the next year was captured and confined in Fortress Monroe. Keokuk was elected by the Sacs and Foxes as grand chief to succeed Black Hawk, one of the most famous Indian chiefs of America, who was deposed, however, after his imprisonment, from which he was released in 1833.

Blackheath (*blăk̦'hēth*), a village and commons of 70 acres in Kent, England, about 7 m. from London. It is a favorite resort for pleasure parties, and is famous in history for insurrectionary gatherings. Among these are the gatherings of Wat Tyler, Jack Cade, and the Cornishmen. In 1011 it served as the camping ground of the Danes. Henry V was welcomed on Blackheath by the people of London, and the army of the Restoration was met in the vicinity by Charles II while on his way from Dover. It is also famous for the exploits of various highwaymen.

Black Hills (*blăk̦ hĭlz*), a mountain group in the southwestern part of South Dakota and the northeastern part of Wyoming; the range is crossed by the boundary line between these two states. The range is about 100 m. long and 60 m. wide. Harney Peak, in South Dakota, rises 7,242 ft. above sea level and is the highest elevation. The region of the Black Hills was one of the best hunting grounds for the Indians, but was purchased from them in 1876. Agriculture is carried on in some districts under irrigation, but in others the rainfall is sufficient to mature crops without artificial watering. Large portions of the Black Hills are covered with timber, consisting largely of pine forests. The district is exceedingly rich in thermal and mineral springs, which have become pleasure and health resorts. Mining is the chief industry, and produces lead, tin, gold, silver, copper, iron, limestone, and other minerals. The annual production reaches many millions of dollars. The district contains a number of cities, among them Deadwood, Hot Springs, Lead City, and Rapid City.

Courtesy Burlington Route

HARNEY PEAK

Highest point in the Black Hills

Blackie (*blăk̦'ĭ*), JOHN STUART, educator and author, born in Glasgow, Scotland, July 28, 1809; died in Edinburgh, Mar. 2, 1895. He studied at the Univs. of Aberdeen and Edinburgh, and at Berlin and Rome. In 1834 he was admitted to the bar, but soon gave up law for a literary career. He translated Goethe's "Faust" and contributed to periodicals, and in 1852 became professor of Greek in the Univ. of Edinburgh. His unconventional lectures on the classics were received enthusiastically. He was also interested in Scottish lore. His chief works include "Homer and the Iliad," "Life of Burns," "Essay on Self-Culture," "Four Phases of Morals," and "Scottish Song."

Blacking (*blăk̦'ĭng*), a preparation used to blacken leather. Numerous recipes for making blacking are in use, most of which are made of bone black with a small quantity of sugar, oil, and sulphuric acid. In some recipes the bone black has been displaced by lamp black or ivory black. Blacking intended for boots and shoes is usually put up in boxes as a paste, in which form it is applied with a brush, but some kinds are in the liquid form.

Blacklist (*blăk'list*), a list kept by business men on which the names of defaulters and delinquents are recorded, and by industrial societies to designate persons as untrustworthy. Such lists are prepared to warn others. Blacklisting has been included among the statutory crimes in some countries. The name has also been applied to the *Proclaimed List of Certain Blocked Nationals,* a rollcall of individuals and firms (introduced during World War II) with which U.S. citizens were prohibited to trade in order to prevent economic aid to the enemy.

Blackmail (*blăk'māl*), a certain tribute levied, in early history, in the north of England and Scotland by robbers in consideration of which they promised protection from their attacks. The term is now used to designate the efforts made to secure hush money, or extort a valuable consideration by threats of public accusation, censure, or exposure.

Black Maria, in American and English slang, the prison van in which delinquents are conveyed between court and prison, or picked up for conveyance to the police station. The term supposedly originated in Philadelphia in the 1830's. Another tradition ascribes it to a Negress named Maria who kept a sailors' boarding-house in Boston, and who often helped the police in handling difficult cases.

Black Market (*blăk mär'kĕt*), an illegal market, brought about by scarcity of commodities, for buying and selling at prices other than those which prevail, or those established by law.

Blackmore (*blăk'mōr*), RICHARD DODDRIDGE, novelist, born at Longworth, England, in 1825; died Jan. 20, 1900. His education was obtained at Tiverton and in Exeter Coll., Oxford. He was admitted to the bar in 1852 and began the practice of law as conveyancer, but devoted much research to literature. His "Lorna Doone" is one of the most popular English romances and has gone through many editions. Among his other noteworthy works are the translation of Virgil's "Georgics," and the novels "Maid of Sker," "Tommy Upmore," "Alice Lorraine," "Mary Anerley," and "Tale of the South Downs."

Black Mountains (*blăk moun'tinz*), a group of mountains in North Carolina, belonging to the Appalachian system. Mt. Mitchell, its highest summit, is the loftiest mountain east of the Mississippi River, with a height of 6,684 ft. It was named after Dr. Elisha Mitchell, of the Univ. of North Carolina, who died here, while making an exploring tour. Other peaks over 6,000 ft. are Balsam Cone and Clingmans Dome.

Black Pope (*blăk pōp*), popular name for the general of the Order of the Jesuits, signifying the great power the Jesuits held in the Roman Catholic Church, principally in the 17th and 18th centuries.

Black Prince (*blăk prins*). See *Edward III.*

Black Sea (*blăk sē*), a large inland sea located south and west of Russia, north of Asia Minor, and east of the Balkan states. Its greatest depth is 6,420 ft., and its mean depth about 2,472 ft. The surface, including the Sea of Azov, is about 165,000 sq. m., or more than five times larger than Lake Superior. It receives the waters of the Dnieper, Dniester, and Danube from Europe, and of the Sakaria and Kizil Irmak from Asia, while the outflow of the Don reaches it through the Sea of Azov. Its waters are less salty than those of the Mediterranean and not so clear, owing to the large inflow from these rivers. It is the site of an important commerce, largely because of its connection with the Mediterranean by the Sea of Marmora and the Bosporus, and many navigable rivers and canals that are tributary to it. In the summer season the surface is at rest and secure for steamboat and ship navigation, but in winter fierce and dangerous storms sweep over it. However, this disadvantage is compensated for in part by its shores and interior being free from rocks and shallows. Oceanic currents are wanting, but the inflowing rivers cause a very similar effect upon its waters. The most important ports include Samsun, Batum, Trebizond, Sinope, Kherson, Odessa, Sebastopol, and Varna. It yields fish in large quantities. Subsequent to the Turkish conquest of Constantinople it remained under the exclusive control of the Turks until 1774, when joint control was ceded to Russia, and later the same rights were granted to Austria, Great Britain, and France. At present the waters are open to the commerce of all nations. In ancient times the Black Sea was known as *Pontus Euxinus*. On its eastern shore was Colchis, the goal of the Argonautic expedition.

Black Shirt (*blăk shûrt*), a name applied to the followers of Benito Mussolini (*q.v.*), derived from their distinctive way of dressing.

Black Snake (*blăk snāk*), or BLUE RACER, a large snake widely distributed over North America, but most abundant east of the Mississippi River. The eyes are large, the head is oval and long, the nostrils lateral, and the body is slender. It attains a length of 9 ft., is not poisonous, and lives on birds and small quadrupeds. It is especially fond of rats. The Australian black snake is closely allied to the cobra and is very poisonous.

Blackstone (*blăk'stōn*), a town of Massachusetts, in Worcester County, on the Blackstone River, and on the New York, New Haven & Hartford R.R. It is about 2 m. N.W. of Woonsocket, R.I. The manufactures embrace cotton and woolen goods, rubber shoes, and machinery. A public library and several schools and churches are among the chief buildings. It has a brisk trade in merchandise and fruit. The first settlement was made on its site about 1700 and it was so named from William Blackstone, who was the first settler at Boston. Population, 1940, 4,566; in 1950, 4,968.

Blackstone, SIR WILLIAM, distinguished jurist, born in London, England, July 10, 1723; died Feb. 14, 1780. He was the son of a silk merchant and was sent by his uncle to Oxford, where he received a liberal education. He became a successful lawyer, and in 1753 delivered a course of lectures on English law at Oxford. In 1758 he was appointed a professor of law at that university, subsequently held the office of counsel to George III, and later was solicitor general to the queen. He published four volumes of his law lectures delivered at Oxford that constitute his celebrated "Commentaries on the Law of England." This work has gone through many editions and translations, and acquired a high reputation as a text among students of law.

Black Tom Explosion (*blăk tŏm ĕks-plō′ zhŭn*), refers to the explosion of the munitions ship *Black Tom* at its pier in Jersey City, N.J., during World War I in July 1916, in which two men were killed and $22,000,000 worth of property was damaged. The explosion was the work of German agents and for many years the U.S. government tried vainly to recover damages. The German government offered falsified statements in the arbitration proceedings. When the fraud was discovered the U.S. requested a reopening of the trial.

Blackwell (*blăk′wĕl*), ANTOINETTE LOUISA BROWN, advocate of woman's suffrage, born at Henrietta, N.Y., May 20, 1825. Her education was received at Oberlin, but she was refused a license to preach. In 1853 she began to preach by invitation, and later was ordained as a pastor of the Congregational Church at South Butler. Subsequently she became a Unitarian and gained eminence as an advocate of woman's suffrage. Among her numerous works are: "The Shadows of Our Social System," "The Sexes Throughout Nature," "The Market Woman," and "The Physical Basis of Immortality." She died Nov. 5, 1921.

Blackwell, ELIZABETH, doctor of medicine, born in Bristol, England, Feb. 3, 1821. She came to the U.S. when young, was graduated from the college at Geneva, N.Y., in 1849, and was the first woman admitted to the practice of medicine in the U.S. She founded the New York Infirmary for Women and Children, in 1853, and the Woman's Medical College of the New York Infirmary, in 1868. She attained much success in the practice of medicine. In 1859 she made an extended visit to Europe, and while there delivered a series of lectures in the Woman's Medical School, London, which were highly complimented. She wrote several works of importance on medicine and social questions. Her "Law of Life" is well known. She died June 1, 1910.

Blackwood (*blăk′wo͝od*), WILLIAM, publisher, born in Edinburgh, Scotland, Nov. 20, 1776; died Sept. 16, 1834. He became a bookseller at Glasgow in 1804, and subsequently founded bookstores in London and Edinburgh. In 1817 he began publishing *Blackwood's Magazine* and by hard work made it a success. Among the contributors to this publication were J.G. Lockhart, Scott, and De Quincey. Politically, the publication supported the policies of the Tories. The business management of the publishing house passed to his sons after his death.

Bladder (*blăd′dẽr*). See *Kidneys.*

Bladder Nut, the name of several plants native to North America and Eurasia. They are so called from the fruit, which is an inflated bladder, and within are a number of hard seeds. In some localities the bladder nut is planted as an ornamental tree, and the seeds are used in medicine as a mild aperient.

Bladderwort (*blăd′ẽr-wûrt*), a genus of aquatic plants found in the marshes and lakes of most countries. In the tropics they grow luxuriantly, and their flowers, like those of water lilies, adorn the surface of ponds and other shallow bodies of water. Australia is exceptionally rich in plants of this kind and they grow abundantly in Great Britain and the U.S. Most of the Canadian varieties have yellow flowers; those of the U.S. have blossoms of violet, yellow, or purple. Little bladders or vesicles on the leaves and stems become filled with air about flowering time, causing those parts to be held above the surface, where the flowers expand, and afterward the air escapes and the plant sinks to the bottom where the seeds ripen. In some species the bladders hold moisture after the air escapes, and the plant is kept fresh and alive even if the water in the pool or marsh sinks away.

Bladensburg (*blā′dęnz-bûrg*), a village of Maryland, in Prince George County, 6 m. N.E. of Washington, D.C. It is on a branch of the Potomac River, and is noted for a battle fought there Aug. 24, 1814, between the British under Gen. Ross and a force of American militia under Gen. Winder, in which the British were successful and shortly after captured Washington. Population, 1940, 1,220; in 1950, 2,899.

Blaine (*blān*), JAMES GILLESPIE, statesman, born at West Brownsville, Pa., Jan. 31, 1830; died in Washington, D.C., Jan. 27, 1893. He was of Scotch-Irish parentage, showed mental skill in his studies at an early age, and was graduated from Washington Coll. when only 17 years old. He became a teacher at the military institution at Blue Lick Springs, Ky., studied law, and later was a teacher in the Inst. for the Blind at Philadelphia. In 1854 he removed to Augusta, Me., and published the *Kennebec Journal* and later the Portland *Advertiser*. In 1858 he was elected to the State Legislature and four years later to the national House of Representatives, in which he served consecutively until 1876, when he became a member of the U.S. Senate. His efficient and prominent career in Congress brought him forward as a Republican candidate for President in 1876, when he lacked only 28 votes of securing the nomination. His name was presented to the convention in a masterly address by Robert G. Ingersoll, who termed him *The Plumed Knight,* by which name he was commonly known.

JAMES GILLESPIE BLAINE

Blaine was a candidate for President a second time in the Republican convention of 1880, when he received 284 votes, but the nomination was given to James A. Garfield. He became Secretary of State under President Garfield and remained in the Cabinet until the death of the latter, when he retired from active service to write the first volume of his famous historical work, "Twenty Years of Congress." In 1884 he was nominated as the Republican candidate for President, but was defeated by Grover Cleveland. He failed of election largely on account of support in the State of New York, which he lost by 1,047 votes out of a total of 1,200,000. Subsequently he spent four years in foreign travel and in writing the second volume of his book. In 1888 he declined to be a candidate for President, and after the election of President Harrison was chosen Secretary of State, which position he filled with eminent ability. In 1892 he again became a candidate for President, but was defeated for the nomination in the convention held at Minneapolis. He fathered the 14th Amendment, opposed a perpetual alliance with Great Britain, presided over the Pan American Congress, and advocated reciprocal trade relations between the U.S. and other nations.

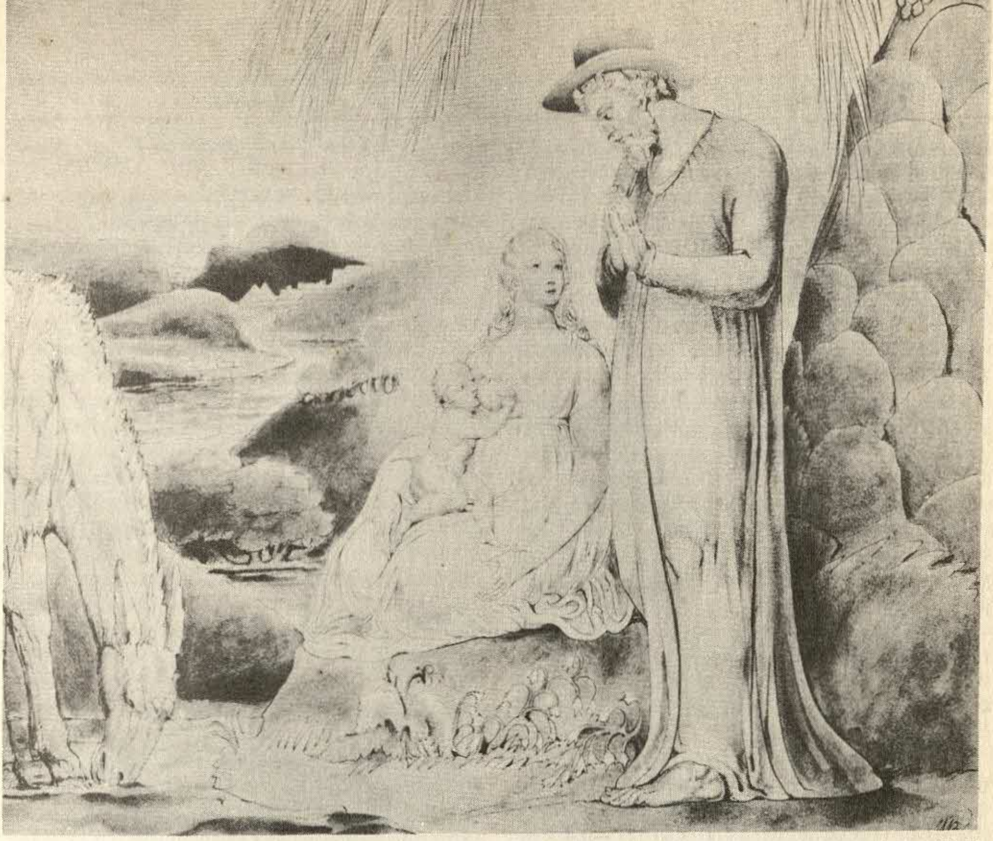
Blaine, JOHN J., statesman, born in Grant County, Wisconsin, May 4, 1875; died Apr. 16, 1934. He was graduated from Valparaiso Univ. (Indiana) and began to practice law at Boscobel, Wis., where he became prominent as an independent Republican. He served as attorney general and governor of Wisconsin and was a member of the U.S. Senate from 1927 to 1933.

Blair (*blâr*), FRANCIS PRESTON, statesman, born in Abingdon, Va., Apr. 12, 1791; died Oct. 18, 1876. He became interested in politics at an early age and supported Henry Clay as a Whig candidate for President. In 1829 he founded *The Globe,* a newspaper important as a Democratic organ, of which he remained publisher until 1845. In 1856 he promoted the organization of the Republican party, presided over the convention which nominated Frémont, and advocated the election of Lincoln. He was influential in promoting the peace conference at Hampton Roads in 1865, and subsequently opposed the reconstruction measures of the Republican party.

Blair, HENRY WILLIAM, lawyer and statesman, born in Campton, N.H., Dec. 6, 1834; died Mar. 14, 1920. He studied law, entered the Federal army, and served during the Civil War and was twice wounded. From 1866-68 he was a member of the Legislature, served in Congress, 1875-79 and 1893-95, and was a member of the U.S. Senate, 1879-91. He was prominent in committee work and delivered noted speeches upon finance, tariff, and educational questions, and advocated woman suffrage and prohibition. After retiring from public service, he took up the practice of law. He published "The Temperance Movement."

Blair, JAMES, educator, born in Scotland in 1656; died in Williamsburg, Va., Aug. 1, 1743. He was graduated from the Univ. of Edinburgh in 1673, became a clergyman of the Episcopal Church, and in 1685 removed to Virginia and engaged in missionary work. In 1690 he took up the project of founding a college, and, after having gathered funds, secured a charter to establish the William and Mary Coll., of which he was the first president. For some time he was a member of the council of Virginia. He published a commentary entitled, "Sermon on the Mount."

Blair, JOHN INSLEY, capitalist, born in Warren County, New Jersey, Aug. 22, 1802; died Dec. 2, 1899. He worked in a small store as a clerk while a boy and later removed to Blairstown and became interested in an iron foundry. It was due to his effort to use anthracite coal in manufacturing iron that the coal fields of Pennsylvania became generally known, and he constructed a railroad to transport the product from the mines to his works. This line was afterward organized as the Delaware, Lackawanna & Western. Subsequently he built many lines of railroads in Iowa and Ne-



Courtesy Metropolitan Museum of Art, N. Y.

REST ON THE FLIGHT INTO EGYPT. DRAWING BY WILLIAM BLAKE

Blake found the best expression for his mysticism in the medium of water colors. This fairylike water color (1806) depicts the Holy Family fleeing Herod's decree of death for all male infants under one year of age

braska, and for some time was a director of the Union Pacific. He made generous gifts to Princeton Coll., to Grinnell Coll., Iowa, and to the Presbyterian Acad. at Blairstown, N.J.

Blair, MONTGOMERY, lawyer and statesman, born in Franklin County, Kentucky, May 10, 1813; died at Silver Springs, Md., July 26, 1883. He was the son of Francis Preston Blair (1791-1876), an American statesman of Virginia. He received a military education at West Point, served in the Seminole War, and became Postmaster General under Lincoln. In the famous Dred Scott case of 1857, he was counsel for the slave, and was noted for his ability as a constitutional lawyer. After 1867 he acted with the Democratic party, and 10 years later wrote several articles in which he attacked the title of President Hayes to the Presidency.

Blake (*blāk*), EDWARD, statesman, born in Adelaide, Ontario, Oct. 13, 1833; died Mar. 1, 1912. He attended Univ. Coll., from which he was graduated in 1857, and was admitted to the bar. In 1867 he was elected to the Canadian Parliament as a Liberal and was Prime Minister, 1871-72. He was Attorney General of Canada, 1875-77, and president of the council, 1877-87, and in 1880 succeeded Mr. Mackenzie as leader of the Liberals. Being in sympathy with the move for home rule in Ireland, he was elected to the British Parliament in 1892 from South Longford, Ireland, and in 1896 became a member of the privy council.

Blake, ROBERT, celebrated admiral, born at Bridgewater, England, in 1599; died Aug. 17, 1657. He enlisted in the cause of Cromwell, in which he distinguished himself by defending Taunton against the royalists, and in 1649 built up a fleet with which he destroyed the squadron commanded by Prince Rupert. In 1652 he began a combat against the Dutch under Adm. van Tromp, and by numerous successes established English naval supremacy. In 1654 he commanded successfully on the Mediterranean, where he gained victories over the fleets of Algeria and Tripoli, and in 1657 defeated the Spanish off the Island of Teneriffe. To the achievements of Blake was due English efficiency as a naval power, which began to take effect in the latter part of the 17th century. His defeat of the Spanish was the last of his successes, as he died before returning to Plymouth.

Blake, WILLIAM, engraver and poet, born in London, England, Nov. 28, 1757; died Aug. 27,

1827. At an early age he showed much interest in drawing and verse-making, and in 1789 published his greatest work "Songs of Innocence." This was followed in 1794 by "Songs of Experience," which he illustrated with about 60 remarkable, original etchings. Later he published other works, among them "Illustrations of the Book of Job." He died in poverty and obscurity, thinking himself a martyr to the poetic art. He is considered one of the most extraordinary men of his time.

Blamey (*blā'mē*), SIR THOMAS ALBERT, soldier, born in New South Wales, Australia, Jan. 24, 1884. He studied first to become a teacher, but decided on a military career in 1906. He took his military training at the Staff Coll. at Quetta, India, and then traveled through the Near East and the Balkans. When World War I started, he was placed third in command of the Australian Imperial Forces in Egypt. His military record was outstanding and he returned to Australia at the end of the war as a brigadier general. Immediately appointed deputy chief of staff, he resigned his commission (1925) to take the post of chief commissioner of the Victoria police. He continued his military interest, though not as a regular army officer, in various positions of command in the Australian Territorial Force. He was appointed chairman of the Manpower Board in 1937, but at the outbreak of World War II returned to the army as commander of Australian forces in the Near East, and was second in command in the disastrous Allied campaign in Greece. Made a full general in 1941, he returned to Australia to aid in planning defenses against an expected Japanese attack. He was appointed commanding officer of the Allied land forces in the Southwest Pacific area (1942), and remained in that post until the end of the war, when he retired from military life.

Blanc (*blän*), JEAN JOSEPH CHARLES LOUIS, historian and socialist, born at Madrid, Spain, Oct. 29, 1811; died at Cannes, France, Dec. 6, 1882. After a common school education, he studied in Paris, became a private tutor at Arras, and in 1834 returned to Paris, where he began writing for periodicals devoted to socialism. In 1839 he founded the *Review of Progress,* in which he published "Organization of Labor"; the work was afterward issued in separate form. His work "History of Ten Years" contains many passages unfavorable to the political prospects of the Orléans dynasty, and for this reason he was compelled to seek safety by escaping to London. While in exile he completed his famous 12-volume "History of the French Revolution," and made other contributions to political and historical literature. On the fall of the empire he returned to France, where he was chosen a member of the national assembly in 1871. Five years later he was elected to the chamber of deputies. His influence in socialism stands pre-eminent in French history.

Blanc, MARIE THÉRÈSE, author, born at Seine-Port, France, Sept. 21, 1840; died in 1907. She became known by publishing romances and works devoted to reforms. In 1893 she visited the Columbian Exposition at Chicago. She was the author of a large number of novels and works on social reforms. Her best-known writings include "Romance of a Mute," "Tony," and "A Remorse."

Blanca Peak (*blăng'ḳä pēḳ*), a mountain in southern Colorado, located in Alamosa, Huerfano, and Castilla counties. It is a part of the Sangre de Cristo Range and rises abruptly without foothills from the level plains in the south to a peak of 14,125 ft., forming one of the highest points in the state.

Blanchfield (*blănch'fēld*), FLORENCE A., nurse, born in Shepherdstown, W. Va., April 1, 1884. She began to train for nursing in Pittsburgh (1906), and after completing her studies there took post-graduate work at Johns Hopkins Hospital. Her distinguished career with the Army Nurse Corps began in 1917, when she was sent to France with the American forces. She served two years abroad, and returning to the U.S. (1919) she again took up civilian nursing. Reappointed to the army (1920), she saw duty at many army posts in the U.S., the Philippine Islands, and China before the outbreak of World War II. In 1942, she was commissioned a lieutenant colonel, and the following year was made a full colonel and given the post of superintendent of the Army Nurse Corps, from which she was retired in 1947.

Blanco (*blăng'ḳō*), ANTONIO GUZMÁN. See *Guzmán Blanco, Antonio.*

Blanco (*blän'ḳô*), CAPE, the name of a number of capes, notably four (one in Africa, one in the U.S., one in Costa Rica, and one in Peru). Cape Blanco in Africa lies on the western shore of the Sahara, near the boundary between the possessions of France and Spain. Cape Blanco in the U.S. is located in Oregon and is the most westerly point on the mainland of the U.S.; it lies south of the mouth of the Sixes River, 30 m. N. of the mouth of the Rouge River; at the western tip is a lighthouse towering 256 ft. above the sea. The cape in Costa Rica lies on the country's west coast; that in Peru lies at the northwestern extremity of the country.

Bland (*blănd*), RICHARD PARKS, statesman, born in Ohio County, Kentucky, Aug. 19, 1835; died at Lebanon, Mo., June 15, 1899. After securing a common school education, he attended Hartford Acad., then taught school in Kentucky, Missouri, and Colorado. He was admitted to the bar in 1860 and practiced law at Rolla, Mo., but in 1866 moved to a 400-acre farm in Lebanon. In 1872 he was elected to Congress as a Democrat from Missouri and served continuously until his death, with the exception of one year. He supported the use of both gold and silver as standard money and opposed national banks. He advocated an increase in the greenback circulation in 1872 and in 1877 introduced a bill which provided for the coinage of not less than $2,000,000 and not more than $4,000,000 of silver bullion each month into the standard silver dollar. Passed (1878) in a modified version as the Bland-Allison Act, the law was vetoed by President Hayes but passed by the Congress over his veto. Bland was a persistent opponent of the rechartering of national banks and an active advocate of the Mills Tariff Bill. At the national Democratic convention of 1896, he was placed in nomination for the Presidency but was defeated by William J. Bryan (*q.v.*).

Blandy (*blăn′dy̆*), WILLIAM HENRY PURNELL, naval officer, born in New York City, June 28, 1890; died there, Jan. 12, 1954. He was graduated from Annapolis in 1913. During World War I, he served aboard the U.S.S. *Florida*. After the war, he made a tour of duty on various fleet units and attended naval graduate schools in gunnery and ordnance. He was chief of the Bureau of Naval Ordnance (1941-43) with the temporary rank of rear admiral. In 1945 Blandy was appointed deputy chief of naval operations, in charge of special weapons, and was in command at Bikini (*q.v.*). In 1947 he was appointed commander in chief, Atlantic Fleet Command. Upon retirement from active service in 1950, he became a director of Gray Mfg. Co.

Press Assn., N.Y.

WILLIAM H. BLANDY

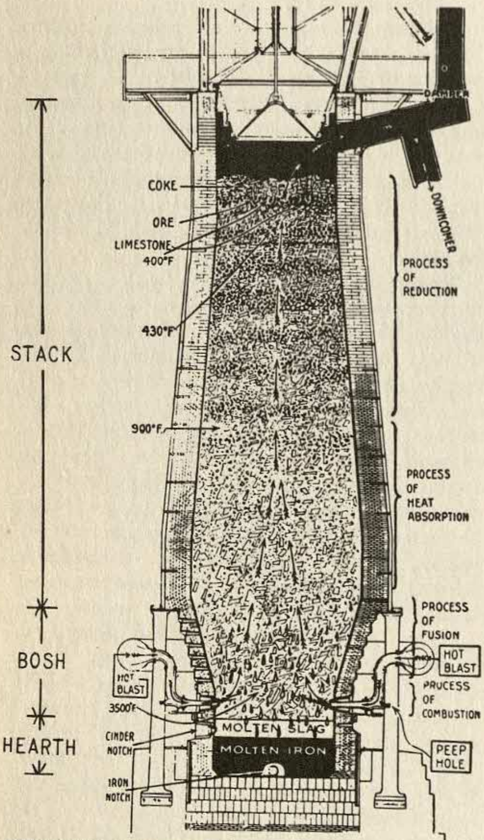
Blank Verse (*blăngk̨ vûrs*), a term generally applied to poetry without rhyme, and first adopted in English literature from the Italian by the earl of Surrey. The classical productions of the Greek and Roman poets are composed in blank verse. It has never been popular in Spanish and French, but in English and German it has been widely used. Marlowe, Shakespeare, and Milton used it frequently, and Maxwell Anderson used it in his verse dramas. The meter of English blank verse is iambic pentameter.

Blarney (*blär′nĭ*), a small town in southern Ireland, *ca.* 5 m. N.W. of the city of Cork. It is the site of Blarney Castle, erected *ca.* 1446 by Cormac McCarthy and famous in Irish history and legend. The Blarney Stone, set high in the wall of the castle's keep, or inner tower, is reputed to confer ability in flattering and persuasive speech upon whoever kisses it. The word "blarney" means speech of this type. Population, *ca.* 725.

Blasco-Ibáñez (*bläs′k̨ō-ê-bä′ñāth*), VICENTE, novelist, born in Valencia, Spain, Jan. 29, 1867; died in Menton, France, Jan. 28, 1928. Because of his radical views and opposition to Spanish royalty, Blasco acquired a long record as a political offender, beginning at the time he was a law student in Madrid. He suffered numerous imprisonments, was once exiled (1896) for a time, and eventually exiled himself from Spain in disapproval of Primo de Rivera's rise to power (1923). Neglecting his law practice, Blasco was active in politics, serving a number of terms as legislative delegate from Valencia, and concentrated his main efforts on journalism and writing. He published *El Pueblo,* a Republican journal, in Valencia and also wrote many novels, which eventually made him wealthy. His early books are considered his best—though not best-known—works. They include "The Mayflower" (1895), "The Cabin" (1898), and "Reeds and Mud" (1902). His most popular novels are "Blood and Sand" (1908), "The Four Horsemen of the Apocalypse" (1916), and *"Mare Nostrum"* (1918).

Blasphemy (*blăs′fê-mĭ*), in Church law, the crime of offending the Divine Being, the Church, the Bible, or religion generally by utterance or writing. Under Mosaic law, blasphemy was punishable by death from stoning, and the laws of both the Byzantine empire and Scotland (until 1825) treated offenders with equal severity. Medieval canon law set various penalties for this offense, including fines, flogging, tongue piercing, imprisonment, and similar measures. Theoretically, blasphemy is still a punishable act under the civil codes of some countries, including England, Scotland, and the U.S. However, penalties are seldom, if ever, enforced.

Blast Furnace, a smelting furnace designed for extracting iron from iron ore by reaction with carbon (supplied in modern furnaces by coke made from coal) burned in a powerful blast of heated air. The ancient Egyptians used a blowpipe for blowing air to increase the heat from burning fuel in furnaces. Romans, Teutons, and Gauls also used a blast of air in hearths for manufacturing iron for lances and spears. These primitive iron furnaces were never hot enough to melt the iron but enabled it to be worked by hammering.



CUTAWAY DRAWING OF A BLAST FURNACE

From primitive iron furnaces, the modern blast furnace finally evolved. The blast furnace is a steel shell lined with firebrick. It delivers iron in molten condition at the hearth, which is tapped about every 5 or 6 hr. to deliver about 250 tons of metal. Ninety per cent of all the molten iron produced in blast furnaces is sent directly to steelmaking furnaces: this is called "hot" metal. Ten per cent is cast into pig iron.

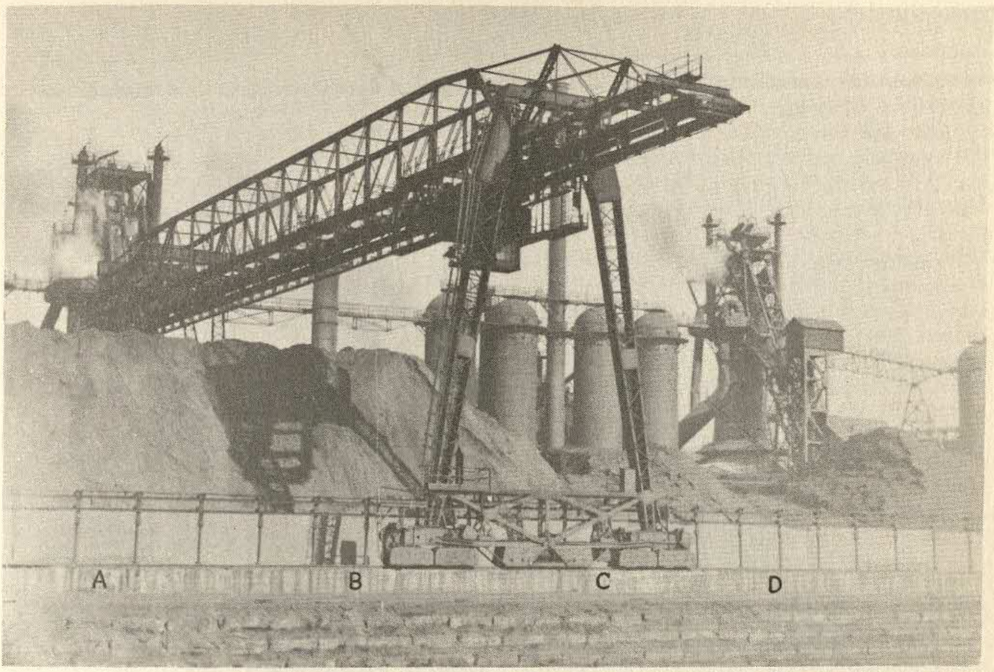
Pig iron is cast by machinery, but previously it was made by casting the molten metal into troughs made in sand, which were connected with a feeder trough, called a "sow," and the fancied resemblance of these filled troughs to a litter of suckling pigs gave such bars the name of "pig iron." Each "pig" weighed about 80 lb.

To produce one ton of iron, 1 7/10 tons of iron ore, 3/4 of a ton of coke, 4/10 of a ton of limestone, and about 4 tons of air are required. In addition to the ton of iron, almost 1/2 of a ton of slag and 5 tons of gas are produced.

In the continuous operation of the blast furnace, limestone, coke, and iron ore are charged (introduced in set amounts) at the top of the furnace, and a blast of heated air is delivered at the bottom of the bosh (*see diagram of furnace*), above the hearth, through the tuyères or blast pipes (openings to admit the air blast). The heated air blast comes from stoves outside of the furnace; air is delivered to the stoves by blowers. Above the entrance of the air blast, the bosh widens out, partly to reduce the velocity of the gases and partly to support the charge, which is being melted by the combustion of the coke. Oxygen from the air blast combines with the carbon of the coke to produce carbon monoxide gas. As the charge travels down through the furnace, the iron oxides of the ore undergo chemical reduction (in the upper part of the furnace) by carbon monoxide, forming sponge iron. As the charge continues downward, the temperature increases; and when the fusion zone is reached, slag is formed by the impurities in the ore and coke combining with the lime formed by calcination (disintegration, with the loss of volatile matter, by the action of heat) of the limestone. The sponge and the slag melt completely and flow downward into the hearth. Slag is lighter than the melted iron and floats on top of it.

Slag is removed from time to time, until a sufficient quantity of molten metal has accumulated, when the furnace is "cast" to draw off the molten iron. The slag is taken away for processing into cement, road fill, and railroad ballast. The molten iron is carried directly to the steelmaking furnaces or cast into molds. The gas leaving the top of the furnace contains carbon dioxide, nitrogen from the air blast, and enough carbon monoxide to be combustible. The gas is conducted by pipes to be utilized as fuel in heating the blast, as fuel for heating furnaces, or as fuel for making steam.

In recent years, material improvements have been made in smelting. These include increasing furnace operating pressure, using hotter air for the blast, controlling the moisture content of the blast, and treating the raw materials to make them easier to smelt. American blast furnaces produce an average of 1,000



Courtesy American Iron and Steel Institute, N. Y., Photo by John P. Mudd

BLAST FURNACE PLANT

A, Blast furnace; B, Loading crane; C, Stoves; D, Blast furnace

The blast furnaces proper are the tallest of the structures in the background. The shorter cylinders are stoves for heating the air used in the blast. A pile of ore and the ore bridge for carrying the ore to the blast furnace are shown in the foreground

tons of pig iron a day. Several furnaces are capable of producing more than 2,400 tons a day. The furnaces have been made more durable by the use of carbon to protect the parts of the lining coming in contact with the intense heat, and also by extension of the use of water cooling. Improvements in methods of constructing linings for blast furnaces have enabled manufacturers to produce over 3,000,000 tons of pig iron before replacing the lining.

The yearly rated capacity of U.S. blast furnaces is about 94,000,000 net tons.

Much effort and expense has been incurred over a long period of time in an effort to discover some practical alternative process that would produce iron economically for use in steelmaking operations. Several processes have attained a near-commercial status. None of these is expected to challenge seriously the position of the blast furnace—at least in the near future—as the major source of iron for steelmaking in areas where coking coals are available.

Blasting (*blăst′ing̃*), the process of disintegrating portions of rock, or other solid substances, by means of an explosive agent, such as powder or dynamite. It is resorted to in mining, tunneling, and quarrying. The usual plan is to bore holes in the rock to be blasted, placing into them the explosive and tamping the hole with clay, sand, or broken stone, and then firing the charge by a time fuse or an electric spark. The discovery of new explosives and the invention of machinery useful in boring and firing have enabled rapid advancement in the art. Dynamite and gun cotton are used where rapid destruction is desired, but where a moderate cleaving or splitting effect is needed, as in blasting for building purposes, powder is superior. Rock-boring machines have been largely substituted for hand labor. By means of these compressed air is utilized to bore holes, in which the blasts are fired. The greatest enterprise in blasting ever undertaken was the removal of the Flood Rock at Hell Gate, New York City. This ledge of rock covered nearly nine acres. To effect the blasting about 240,000 pounds of powder, dynamite, and other explosives were used. The rocks broken up weighed millions of tons.

Blauvelt (*blô-vĕlt′*), LILLIAN EVANS, singer, born in Brooklyn, N.Y., March 16, 1874; died in Chicago, Ill., Aug. 29, 1947. She began the study of the violin at the age of seven and later studied singing in Paris, France. She made her debut as a singer in Brussels, Belgium, in 1888. After 1898 she made annual tours of Europe and America. In 1899 she performed before Queen Victoria;

and in 1902 she sang the "Coronation Ode" for Edward VII during the festivities for his coronation. Among her notable operatic roles were *Marguerite* in Gounod's "Faust," *Micaela* in "Carmen," *Zerlina* in "Don Giovanni," and *Juliet* in Gounod's "Romeo and Juliet." She retired from the stage about 1927.

Blavatsky (*blạ-văt′skĭ*), ELENA PETROVNA, née HELENA HAHN, theosophist, born in Ekaterinoslav (now Dnepropetrovsk), Russia, in 1831; died in London, England, May 8, 1891. The descendant of a noble family, she traveled widely and came to the U.S. in 1873. She organized the Theosophical Society with Henry Steel Olcott (1832-1907), of Orange, N.J., in 1875, and established a branch in India in 1879. She was highly regarded as an occultist, but in 1884 it was proven that many of her claims to mysterious power were fraudulent. Olcott continued to work in behalf of the society on a legitimate basis. Another well-known pupil of hers was Annie Besant (1847-1933), of England, who became a Nationalist Indian leader. Mme. Blavatsky wrote "The Voice of Silence" (1889) and other books.

Bleaching (*blēch′ĭng*), the art of rendering materials perfectly white or nearly so. The ancient methods of bleaching consisted of exposing the fabrics to the action of the sun. The fabrics were laid out and frequently wetted, and, after remaining exposed to the actinic rays of the sun, they became greatly whitened. A class of fine fabrics are known as *lawns* from the methods of bleaching them by spreading the goods on plots of grass. Likewise, the best grade of linens are known as *hollands,* since the Dutch excelled in bleaching that class of fabrics.The present process consists of employing bleaching agents, as diluted sulphuric acid or chloride of lime. Some fabrics are bleached by alternately dipping them into a bleaching powder made of chloride of lime and sulphuric acid. The process is modified in accordance with the material bleached; calico, silk, wool, linen, and various other fabrics require a greater or less dilution of the chemicals and a varied number of dippings. Bleaching is practiced to a considerable extent in treating paper, ivory, oils, and wax, which are greatly enhanced in value by whitening.

Blende (*blĕnd*), or SPHALERITE, the native sulphide of zinc, from which zinc is obtained. It occurs both massive and crystallized, either in primary or secondary rocks, and is yellow or brownish in color. Deposits occur in many parts of the U.S. and Canada. It is especially abundant in Missouri, Illinois, and Wisconsin. At Cornwall, England, it is found with lead ores and is worked for the zinc and sulphur, the latter being used in making sulphuric acid. The best grade contains about 30 per cent of sulphur and 65 of zinc.

Blenheim (*blĕn′ĭm*), a village in Bavaria, Germany, about 23 m. N.W. of Augsburg, on the Danube River. It is noted for the great battle fought here on Aug. 13, 1704, in which the allied forces of England and Germany gained a complete victory over the Bavarians and French. Each of the contending armies consisted of about 53,000 soldiers. The former were commanded by Prince Eugene and the Duke of Marlborough and the latter by Prince Rupert and Marshal Tallard. The defeated army lost 12,000 in killed and 14,900 prisoners, while the remainder retreated in disorder. In 1800 the French defeated the Austrians near Blenheim. The village has a population of 825.

Blennerhassett (*blĕn-nĕr-hăs′sĕt*), HARMAN, an accomplice of Aaron Burr, born in Hampshire, England, Oct. 8, 1764. He was educated at Westminster School, London, and Trinity Coll., Dublin, and in 1790 received the degrees of B.A. and LL.B. Becoming dissatisfied with his Irish estates, he sold them and came to America with about $100,000. In 1798 he bought Backus Island, an island in the Ohio River near Parkersburg, W. Va., containing about 170 acres. On this he built a beautiful mansion and adorned it with works of art, a library, and scientific appliances. His home was enjoyed by many visitors, among them Aaron Burr, who was bitter on account of political disappointments. He became interested in Burr's scheme to form an empire in the southwestern part of North America and contributed considerable money for arms, boats, and equipment with which to begin the enterprise. About this time President Jefferson issued a proclamation against the scheme, and, fearing arrest, Blennerhassett left the island and joined Burr at the mouth of the Cumberland River. Subsequently he was arrested, but was acquitted by the government. His fine mansion was used as a storehouse and afterward destroyed by fire. Later he bought 1,000 acres of cotton land in Mississippi and became a planter, but it proved an unsuccessful investment. In 1819 he removed to Montreal where he endeavored to acquire a legal practice, but failed. He sailed to Ireland in 1822, where he failed in earning a livelihood, and died Feb. 1, 1831, in complete obscurity on the island of Guernsey.

Bleriot (*blĕr′ĭ-ō*), LOUIS, aviator and inventor, born in Nantes, France, 1872; died Aug. 2, 1936. A pioneer in aviation, he constructed his first plane—which operated with flapping wings—in 1900, and later, deriving ideas from the Wright brothers, produced a machine that would stay aloft a short time. He established a record in 1908 by staying in the air 37 minutes, and later 50 minutes. He was hailed the world over in 1909 when, in a monoplane of his own construction, he became the first man to fly across the English Channel, and during the same year established several

Courtesy American Foundation for the Blind, Inc.

READING BRAILLE

Braille, a system enabling the blind to read, contains 43 signs based on an arrangement of dots representing letters of the alphabet, numerals, and diphthongs. The system, developed by Louis Braille, a Frenchman who was himself blind, is based on the point writing method introduced by Charles Barbier (1767-1841)

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other records in flying. He had his first serious accident later that same year, and gave up flying to devote himself to the manufacture of planes. Bleriot predicted trans-Atlantic flights when he made his first trip to the U.S. in 1912. In addition to the many flying awards he received, he had the distinction of holding Pilot License No. 1. He died of heart failure at his home in Paris in 1936.

Blesbok (*blĕs′bŏk*), the South African antelope characterized by a large white patch on the muzzle.

Blessington (*blĕs′ĭng-tŭn*), MARGUERITE, COUNTESS OF, famous beauty, author and society leader, born near Clonmel, Ireland, Sept. 1, 1789; died June 4, 1849. She was a daughter of Edmund Power and when 15 years of age married Capt. Maurice St. Leger Farmer, and shortly after his death became the wife of the Earl of Blessington. In 1818 she made an extended tour of Europe and subsequently lived in Gore House, London, where she gathered about her a number of prominent men and women. When Louis Napoleon became King of France, she removed to Paris and engaged in literary work. Her chief writings are: "The Idler in France" and "Conversations With Lord Byron."

Blind (*blīnd*), the state of being deprived of the sense of sight. Blindness is most prevalent in the tropical regions, and least common in the temperate. It is more general in the Eastern Hemisphere than in the Western. A very small number of children are born blind, although there are hereditary tendencies more or less prevalent. By far the greater number of cases result from accident or diseases of the eye, such as inflammation, cataract, or defect of the optic nerve. Syphilis in one or both of the parents may cause blindness in a child. Old age is frequently accompanied by blindness, owing to a drying of the lachrymal canal and humor of the eye, or to an impairment of the crystalline lens or other vital organs. Frequently some slight deformity of the parts of the eye or its surroundings leads to a loss of sight. Blindness is generally attended by an increased vitality of the other senses, thus in part compensating for the loss of the visual faculty.

Asylums for the blind were established in Germany and France as early as 1260, the prime object being to relieve the Crusaders who had lost their sight in the East. Subsequently asylums of this character were established and are at present supported in all civilized countries. In the U.S. a large number of institutions are maintained, both for adult and minor blind, by the several states under a system of general taxation. Among a number of such schools in Canada may be mentioned the Ontario Inst. for the Blind at Brantford. In these institutions the industrial arts are taught successfully, usually with a view to aid in making the students self-supporting. The courses of study generally include all the common and high school branches and industrial arts, such as

Courtesy American Foundation for the Blind, Inc.

INSTRUCTION VIA TALKING BOOK

Sightless students take notes on braille typewriters as a "talking book" is played on the phonograph

knitting, weaving, and divers household duties.

Trades for the blind generally include various applied arts in which patterns can be felt. Watchmaking and production of precision tools can also be learned by the blind, since their haptic sense is generally highly developed.

A special career for the blind lies in the field of music, from pianoforte tuning to virtuosity on a given instrument.

Many systems of alphabets for the blind have been invented and are now in successful use. The print consists of characters raised above the surface of the paper and is read by means of passing the fingers over the characters, thus determining their signification by means of the sense of touch. The textbooks used are made on this plan both for teaching and for general reading. Another method of teaching is by what is known as the *point system*. It consists of a number of dots instead of the letters of the alphabet. In writing the blind use a dotted or grooved appliance over which they lay paper and with a style dot on the surface. Raised characters then appear on the underside, the meaning of which can be determined by passing the fingers over the lines. The system of writing used by the blind has been so perfected that by means of texts, and skill in determining the different characters, it is possible for those who have lost their sight to become quite as well trained as the more fortunate who have full use of the eye.

The first books printed in raised characters for the blind were manufactured in France in 1784. Many systems of letter characters came into use. The first American book for the blind was printed in 1834, in Philadelphia, Pa.

The Bible was the first book to be adapted to the special needs of the blind, but today books in every field of human science and literature are reproduced for the use of the blind. The most widespread system of lettering for the blind is that of Louis Braille (1809-52). The Hall-Braille writer is a device which uses the principle of the typewriter for the printing of raised characters.

The so-called "Seeing-Eye" dogs, usually German shepherds, introduced as guides for the blind in 1929, have proven very successful. The dogs direct blind people in traffic and protect them generally.

Blind (*blĭnt*), KARL, agitator and writer, born in Mannheim, Germany, Sept. 4, 1826; died May 21, 1907. He studied at the Univs. of Heidelberg and Bonn, and in 1848 participated in a revolutionary movement in Baden. The following year he took part in an insurrection in southern Germany and was sentenced to imprisonment for eight years. He was made envoy to Paris shortly after his release, which was brought about by the people of Karlsruhe, but was expelled from France and finally settled in London. He is the author of many works relating to government and revolutionary movements. He supported the Polish rising in 1853 against Russia, the American Union cause against the Confederacy, the German cause in the French War of 1870-71, the Italian cause against the Papacy, and the Russian movement for freedom.

Blind Fish, a class of fish common to the waters of caves. These fish have rudimentary eyes covered with skin, but are totally destitute of sight, and the body is covered with small sensitive projections, or papillae, which serve as organs of touch and partly compensate for the absence of vision. Like all other cave animals, they are colorless or pale. The body ranges in length from 3 to 5 in. and has fully developed fins, enabling the fish to move about with facility. They feed upon small insects and crustaceans common to caves. Many species are found in the Mammoth Cave of Kentucky (*q.v.*), in the cave of Cacahuamilpa, Mexico, and the caves of New Zealand.

Blindness (*blīnd'nĕs*), lack or loss of sight, inability to see. In *day blindness* the vision is better by night than by day. In *night blindness* the visual defect is more marked by night or poor light than by day, often due to a deficiency of vitamin A. *Concussion blindness* is a functional blindness, usually temporary, due to violent explosions, caused by bombs, etc. *Functional blindness* is the inability to see although the eyes and their nervous control are intact, usually on a basis of hysteria. *Psychic blindness* describes sight without recognition due to some brain lesion. There are also many types of blindness, partial or complete, due to disease or injury to the many component parts of the eye, or of the brain and nerve structures, especially the optic nerve, essential to its function. See *Blind;* also *Color Blindness.*

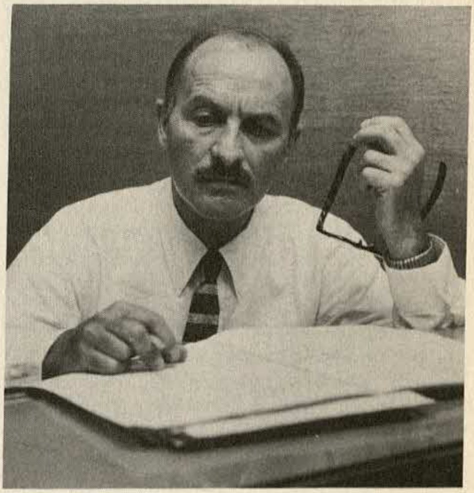
Bliss (*blĭs*), SIR ARTHUR, composer, born in London, England, Aug. 2, 1891. He was educated at Rugby, Cambridge Univ., and the Royal Coll. of Music in London. His unusual "A Colour Symphony," in 1922, which attempted to show relationships between tones and colors, won him recognition in the field of modern music. Bliss visited the U.S. in 1923-25, and in 1940 he held a professorship in music at the Univ. of California. His varied compositions include music for ballet—"Checkmate" (1937), "Miracle in the Gorbals" (1944), and "Lady of Shalott" (1956); for motion pictures—"Conquest of the Air" (1939), "The Beggar's Opera" (1953); instrumental music—"Music for Strings" (1935) and concertos for piano (1939) and violin (1955); vocal music—"Rout" (1920), "The Women of Yueh" (1923); and the opera "Tobias and the Angels," first performed on television in 1960. Knighted in 1950, Sir Arthur was made master of the queen's music in 1953.

Bliss, PHILIP PAUL, evangelist, born in Clearfield, Pa., July 9, 1838; died in Ashtabula, Ohio, Dec. 29, 1876. A singer and teacher of music before he became associated with Dwight L. Moody (*q.v.*), Bliss became noted for his gospel hymns. They appeared in such books as "Gospel Songs" (1874, with Ira D. Sankey) and included the well-known "Pull for the Shore," Hold the Fort," and "Hallelujah! 'Tis Done."

Bliss, TASKER HOWARD, army officer, born in Lewisburg, Pa., Dec. 31, 1853; died in Washington, D.C., Nov. 9, 1930. He studied at Lewisburg and West Point and was commissioned in the U.S. Army in 1875. Bliss became military attaché at the U.S. legation in Spain in 1897. Recalled in 1898, at the beginning of the Spanish-American War, he served as chief of staff to Maj. Gen. James H. Wilson in Puerto Rico. He was Army chief to staff in 1917 and served on the inter-Allied war council in France, with the rank of general. Later, as one of the five American peace commissioners, he signed the Versailles treaty.

Blitzkrieg (*blĭts′krēg*), German, meaning "lightning war" (blitz=lightning, krieg=war), applied in recent years to the German strategy of surprise attack by a powerful concentration of all types of troops in close co-operation, sweeping the defender back by an overwhelming assault.

Blitzstein (*blĭts′stīn*), MARC, composer, born in Philadelphia, Pa., March 2, 1905. A critic and pianist of merit, he began his career as a child prodigy, playing on the concert stage at the age of five, and composing at seven. He made his debut as soloist with the Philadelphia Orchestra (1920). A student of Arnold Schönberg and others, he continued his musical education in Berlin and Paris (1926-27). His music includes a number of operas or "musical plays"—his own description—including "The Cradle Will Rock" (1937), "No for an Answer" (1939), "Regina" (1949), and "Juno" (1959). He wrote the incidental music for the 1958 production of "A Midsummer Night's Dream" at Stratford, Conn.; and adapted and translated Kurt Weill's "The Threepenny Opera" for an American production in 1954. His style has been described as reflecting that of Paul Hindemith and Igor Stravinsky.



MARC BLITZSTEIN

Blizzard (*blĭz′ẽrd*), a fierce storm attended with falling or driven snow and a low temperature. Blizzards are common in the north central part of North America, especially in the great central plain of Canada and the northern portion of the Mississippi Valley, where the thermometer frequently falls as low as from 10° to 50° below zero in the colder part of winter. The movement of the wind is usually from the northwest.

Bloch (*blŏk*), ERNEST, composer, born in Geneva, Switzerland, July 24, 1880; died in Portland, Ore., July 15, 1959. After studying in Brussels and Frankfort-on-the-Main, he came to the U.S. in 1916 and was naturalized in 1924. He instructed at the David Mannes School, New York City; founded the Cleveland Inst. of Music and was its director (1920-25); directed the San Francisco Conservatory of Music (1925-30); and later taught at the Univ. of California at Berkeley. His highly individualistic compositions, which are free of passing modes, include the operas "Macbeth" (1910) and "Jézabel" (1918), "Israel Symphony" (1912-15), *Trois Poèmes juifs*"

(1913), the symphony "America" (1928), and concertos and other orchestral pieces, such as "Schelomo" (a rhapsody for cello and orchestra, 1915) and "String Quartet No. 5" (1956). His "Sacred Service" (1932-34), a setting, for baritone, chorus, and orchestra, of the Reformed synagogue service, has been frequently performed in concert as well.

Blockade (*blŏk-ād′*), in war, the act of cutting off the enemy's supply and/or communication routes. A *commercial blockade* is usually effected by naval operations, closing enemy ports to commerce. A *military blockade,* though not a siege, has features of the latter, aiming to isolate the enemy from his source of supply. According to international law, a ship must be caught in the act of trying to evade the blockade before it can be seized by the blockading vessels. See also *Contraband; Embargo.*

Blockhouse (*blŏk′hous*), a kind of fort used in early times as a means of protection against an enemy. It was constructed of timber, usually of heavy logs or blocks, and had openings for musketry on all sides to permit firing upon those making an attack. Originally it was built of one story, but later an upper story was constructed to overhang the lower and in the overhanging floors were holes to permit firing upon an enemy who might attempt to gain entrance or set the structure on fire. Blockhouses were used extensively in the early settlement of America, when timber was plentiful and there was no fear of attacks by artillery. See also *Pillbox.*

BLOCKHOUSE OF THE REVOLUTIONARY PERIOD

Block System (*blŏk sĭs′tĕm*), a series of consecutive "blocks" or space-divisions to control railway traffic and so prevent accidents. The purpose is to keep trains on the same track and going in the same direction a certain distance apart, or, on single-track lines, to keep trains moving in opposite directions from entering upon the same section of track. A "block" consists of a section of track of a defined length. Entry of trains into such a blocked-off section of line is regulated at the entering end by a *block signal,* which indicates, by colored lights or movable arms, whether the block ahead is clear or occupied. On some railways, the block signal is operated automatically as a train enters the block and leaves the other end; on others, the signals are controlled electrically from a central signal office, where train movements are constantly recorded on an electrically operated signal board.

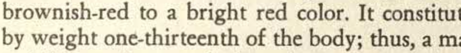
BLOEMFONTEIN. HOFFMAN SQUARE

The block system, which first became effective when Sir Charles Gregory adapted the semaphore (*q.v.*) to railway use in 1841, is now used on nearly all the principal railways of Europe and America. This control system has almost eliminated collision-type accidents, which were once the worst hazard of railroading.

Bloemfontein (*blōōm′fŏn-tān*), a city in South Africa, capital of the Orange Free State, 95 m. E. of Kimberley; also known as *Center City.* It is located on a plateau about 4,500 ft. above the sea, on the Modder River, and is surrounded by a fertile region. It is the seat of the Appeal Court of South Africa and of the state university. Among the buildings are the Raadsaal (House of Parliament of the old Boer Republic), Anglican and Roman Catholic cathedrals, and the City Hall. Bloemfontein has two famous observatories, a hospital, an asylum for the insane, several educational institutions, and a famous wild game preserve. The trade is chiefly in wool, cereals, and merchandise, and manufactures consist of matches, machinery, and clothing. The city is also an important military base. At the time of the Boer War Bloemfontein was a center of hostilities, but in 1900 surrendered to Lord Roberts. Population, *ca.* 28,000.

Blondin (*blôn-dăn′*), JEAN FRANÇOIS GRAVELET, acrobat, born at St.-Omer, France, Feb. 28, 1824; died Feb. 22, 1897. He came to America in 1852 and toured the country as an acrobat. While visiting Niagara Falls he conceived the idea of crossing the cataract on a rope stretched over the stream near the location of the present cantilever bridge. The rope was about 1,200 feet long and 160 feet above the water, and on Aug. 17, 1859, he performed the feat in the presence of 50,000 people. He repeated the performance in 1860 in the presence of the Prince of Wales. While passing over the cataract, he gave various acrobatic performances, such as pushing a wheelbarrow and carrying a man on his back. Subsequently he returned to Europe and devoted most of his time to giving exhibitions at the Crystal Palace in London.

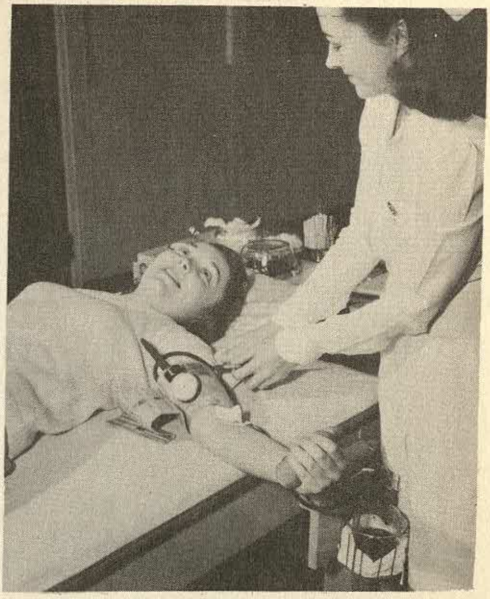
Blood (*blŭd*), the fluid that circulates through the arteries and veins of animals and is essential to the growth of the tissues and to the preservation of life. In the human body it varies from a brownish-red to a bright red color. It constitutes by weight one-thirteenth of the body; thus, a man weighing 169 pounds has about 13 pounds of blood. Under the microscope it appears as a pale yellowish fluid, called *plasma*, in which float a large number of disks, called *corpuscles,* some white and others red, of which the red are more numerous. The red disks are circular, with rounded edges, and concave on the upper and lower surfaces. These disks are so small that if 3,500 were placed side by side they would measure a linear inch, and about 15,000 placed one upon another would make a column about one in. high. It is estimated that about 83,000,000 are contained in one cubic in. of blood. The size of the disks in human blood differs somewhat from that found in other animals, but it is uncertain whether microscopists can determine the difference with accuracy. They have a well-known tendency to collect in piles like rolls of coins. With every breath about 20,000,000 new disks are formed in the blood and the old as constantly die.



BLOOD CORPUSCLES (HIGHLY MAGNIFIED)

A, Human blood; B, Non-mammal blood

The plasma contains *fibrin,* a form of albumen which resembles the white of an egg, and various mineral substances, including potash, lime, phosphorus, magnesia, and iron. In the blood are all the materials required for the growth and maintenance of every organ. It is rich in albumen for the muscles and mineral matter for the bones. The red disks are the *air cells.* They carry the essential oxygen necessary to every operation of life, and it is carried to all parts where repairs are made and growth takes place. It stimulates action and tears down worn-out parts. In serving its purpose the muscles and tissues are burned much like fuel in a stove. Made impure by this action, the blood is caught up by the circulation and carried back to the lungs, where it is purified and again thrown back into the system. The vessels carrying the blood from the heart are called *arteries,* those carrying the blood back to the heart are called *veins,* and the two are connected by minute tubes about $\frac{1}{2000}$ to $\frac{1}{3000}$ of an inch in diameter, called *capillaries.*



Courtesy American Red Cross

BLOOD DONATION

Careful precautions are taken before a prospective donor may give his blood at a Red Cross blood donor center. The donor must be in good health, his temperature and blood count normal. While the blood is being withdrawn from the body, the donor's blood pressure is constantly watched on a gauge such as the one shown in this picture

When blood is exposed to the air, it forms clots; the process is called *coagulation.* This serves a useful purpose in many ways. It checks bleeding in ordinary cases by the fibrin forming a temporary plug, which is later absorbed when the healing process is finished. *Transfusion* is the process of restoring vigor in feeble persons by infusing healthy blood into their veins. In the 17th century it was thought to be the means of prolonging indefinitely human life. During World Wars I and II the technique of blood transfusion became highly developed and in World War II especially, innumerable lives were thus saved. Death among wounded soldiers has by means of blood transfusion been reduced to half during World War II. The preservation of whole blood

Courtesy American Red Cross

SEALING CANS OF PLASMA

After blood is collected from donors, the plasma is separated from the blood cells, dried, and placed into bottles. The bottles of plasma and distilled water are then packed into cans together with the tubes and needles necessary for transfusion, the air being pumped from the cans and replaced by nitrogen to prevent deterioration of the rubber tubes. Plasma will keep for long periods of time without refrigeration

for transfusion purposes has proved unnecessary and impracticable since plasma, the liquid part of the blood which remains after the blood cells (corpuscles) are removed, can be preserved indefinitely and also obviates the necessity of matching types of blood. The blood cells alone are divided into various types which, in transfusion, must be matched, while plasma can be given to anyone without distinction. Plasma is usually dehydrated into a powder which can be kept for years, and is sent in this form to the battle zones. Serum albumin, a more highly concentrated derivative of the plasma itself, makes the forwarding process easier since it takes even less shipping space.

The blood of animals is an important commodity of commerce. It is used as an article of food, and for making blood sausage and blood cake. To prepare it a pan is placed at the mortal wound of the animal slaughtered, in which it is caught and whipped rapidly to gather the fibrin. The remaining parts, consisting of *albumin* and *serum,* are the portions used as food. In large packing houses blood is one of the most important products of commerce. It is caught in large pans and carried to drying vats, where the albumen is coagulated into a thick mass. This mass is compressed by means of great hydraulic presses and sold for fertilizing. Blood is also valuable in the manufacture of buttons and Japanese lacquer work. Many of the richly colored buttons sold in the market are made of blood, which has been compressed by means of hydraulic machines, and afterward cut in shape by edged instruments. See *Rh Factor.*

Blood Circulation (*blŭd sẽr-ḳû-lā′shŭn*), the movement of the blood in living bodies, consisting of the *systemic* and *pulmonic.* The blood is propelled from the left ventricle, thence passes through the aorta and its arterial branches, and reaches the capillaries in all parts of the body; it then passes into the small veins and from them into the larger ones, and is carried to the right auricle; this is the *systemic circulation.* The *pulmonic circulation* consists of its passage from the right ventricle into the pulmonary artery and its branches in the lungs, thence flowing through the capillaries, it collects in the pulmonary veins, and passes from them through the left auricle into the left ventricle from which it again enters the systemic circulation. The heart is the cause of circulation. It is aided by the chest movement in breathing, the elastic and muscular walls of the arteries, and the intermittent muscular pressure on the veins. Harvey (*q.v.*), an English physician, discovered the circulation of the blood in 1628, but how the blood passes from the arteries to the veins was not known to him. The capillaries and their functions were not discovered until three years after his death.

Bloodhound (*blŭd′hound*), a kind of dog distinguished for its keen scent and the persistency with which it follows the track of game. The ears are long and smooth, and both the ears and lips are pendulous. It is a trustworthy animal in the chase, and is employed to track escaped prisoners and suspects of recently committed crimes, though its value for the latter purpose is not generally conceded. The Cuban, English, and Russian bloodhounds are among the best-known species.

Blood Pressure (*blŭd prĕsh′ẽr*), the force exerted by the blood on the walls of the arteries. The force depends on the energy of the heart action, the elasticity of the walls of the arteries, the resistance of the capillaries, the volume of the blood, and the viscosity of the blood. Tension is another term for blood pressure. The maximum pressure occurs at the time of *systole* (contraction) of the left ventricle of the heart and is called maximum or *systolic.* The minimum pressure is felt at the *diastole* (relaxation) of the left ventricle (driving chamber of the heart), and is called minimum or *diastolic pressure. Basic blood pressure* is that pressure exerted on the blood by the contractile walls of the blood vessels independently of the additional pressure due to the systolic contraction of the heart. The *pulse*

U. S. Army Signal Corps Photo

BLOOD TRANSFUSION

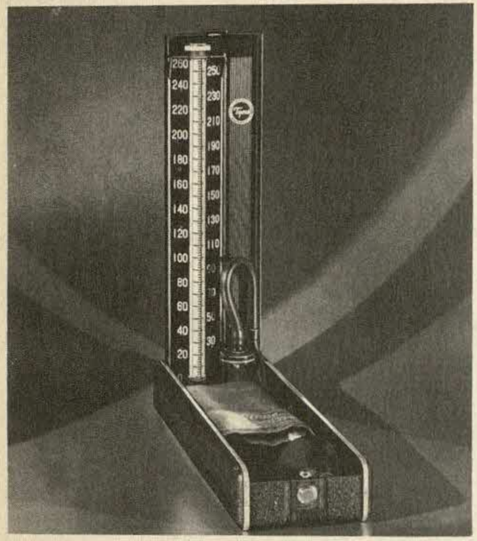
In Sicily during World War II

pressure is the difference between the systolic and the diastolic pressures. The elasticity of the arterial walls and the resistance of the smallest arteries (arterioles) and capillaries to blood flow are both essential for the development of the diastolic pressure. As the contents of the ventricle are thrown into the already overfilled system during systole, the added pressure which is then exerted upon the arterial walls causes their further distention. After the completion of systole the elastic vessel walls rebound and pressing upon the blood contained force it onward through the more distant vessels. The space within the artery returns to its previous diameter and the energy which has been stored up during the stretching of the elastic wall is in this way gradually expended in diastole. This explains the pulse, which anyone can learn to feel over an artery with a little practice. One might say that the elastic recoil of the wall of the artery acts like an assistant pump in driving the blood onward in a continuous stream between heartbeats.

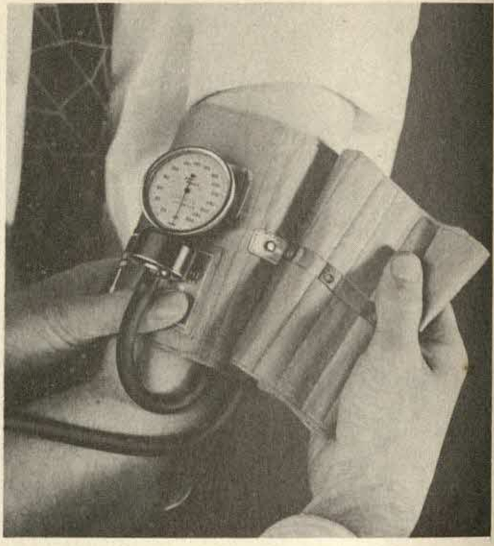
Blood pressure is measured in terms of the height of an open column of mercury measured in millimeters. The instrument commonly used by physicians, dependent on this principle for determining blood pressure, is called a sphygmomanometer. The cuff of the instrument wrapped around the arm or leg over an artery transmits, by air pumped into it, the pressure of the pulsating artery to the mercury measuring column so it may be read. The average normal human blood pressure is about 120 mm. over 80 mm., usually written as 120/80, meaning 120 millimeters systolic pressure and 80 millimeters diastolic pressure.

Blood pressure levels are definitely influenced by age. At birth the systolic pressure averages about 40 mm., rising to about 80 mm. at the end of the first month, thereafter gradually rising to 105 mm. at about 12 years, and then suddenly rising with the onset of puberty to about 120 mm. at 17 years. A steady though slight rise in blood pressure from adolescence to old age is the rule in normal healthy people. The average blood pressure at age 60 is about 135/87. There is an increase of about 0.5 mm. in the systolic and about 0.2 mm. in the diastolic pressures per year after the age of 20. Up to the time of the menopause in woman the systolic pressure is 8-10 mm. lower than for men; however at this time there is a rather abrupt rise and the female pressure remains slightly above the male average thereafter.

There is some correlation between the blood pressure and the body weight. The systolic pressure has been found to average 7.5 mm. higher in heavy individuals than in those of normal weight. In markedly obese but otherwise healthy people the difference is even greater. The incidence of *hypertension* (abnormally high blood pressure) is definitely greater in overweight persons. The systolic pressure rises slightly but definitely, 6-8 mm., during and after meals, lasting about an hour. Blood pressure, especially the systolic, is markedly affected by emotions—excitement, fear, worry, etc. These effects are brought about by increased heart action and changes in the state of the vessels (increased tone or contractility) due to nervous impulses from the brain to the heart and arteries. The release of adrenalin into the blood stream during emotional stress is another factor of increase in blood pressure. During quiet, restful sleep, a fall of 15-30 mm. in the systolic pressure may be shown. Sleeping blood pressures are often taken by hospital physicians upon patients whose emotional state precludes getting a reliable indication of blood pressure while awake. If sleep is disturbed by dreams and restlessness, the pressure may be increased rather than decreased. Exercise, if strenuous, has the greatest of all physiological effects upon the blood pressure. At the onset, *i.e.*, at the moment the effort is contemplated, the systolic pressure begins to rise and reaches a height of 180 to 200 mm., with the diastolic pressure showing a lesser rise to 100 to 110 mm., thus the pulse pressure is increased. Immediately after the exercise, the pressure drops momentarily to or slightly below normal, due to sudden relaxation of muscles and thus of compression on the vessels, then rapidly rises again to the previous high level, whence it gradually falls, in the normal person, in one to four minutes.



Courtesy Taylor Instrument Co., N. Y.



Courtesy Taylor Instrument Co., N. Y.

SPHYGMOMANOMETERS FOR MEASURING BLOOD PRESSURE

Posture also affects blood pressure. Diastolic pressure is lowest while lying flat and slightly higher in the standing than in the sitting position. The changes are probably due to over-compensation for the effect of gravity upon the circulatory system. In persons with abnormally low blood pressure (*hypotension*) the reverse may be true, *i.e.*, the systolic pressure may be higher in the prone than in the standing position, hence a reason for lowering the head and elevating the legs of a person in physical shock, in addition to the necessity of trying to prevent deficiency of blood supply to vital centers in the brain.

Bloodroot (*blŭd′rōōt*), a plant of the poppy order, native to many parts of North America. It takes its name from the sap of the root, which is a deep orange color, and contains the alkaloid *sanguinaria,* used in medicine as a stimulant and expectorant. The plant grows wild in many parts of Canada and the U.S., has heart-shaped and deeply lobed leaves, and flowers early in the spring.

Bloom (*blōōm*), SOL, Congressmăn, born in Pekin, Ill., Mar. 9, 1870. Bloom retired from business as a millionaire in 1920 after a career as a fight promoter, theater owner, showman, and real estate operator. In 1923, he accepted the suggestion of the Democratic organization, Tammany Hall, that he run for Congress, and after a contested election, which was subjected to House investigation, he was seated in April 1924. His career in Congress was a colorful one, ranging from fist fights on the House floor to heading the George Washington bicentennial celebration of 1932 which ran for nine months. During the Roosevelt era, Bloom was a supporter of most New Deal legislation, and he became permanent chairman of the highly important Foreign Affairs Committee in 1939. He remained in this capacity through 1946, remaining on the committee during the two years of the Republican-controlled 80th Congress, although not as chairman. With the return of the Democrats to power, he again assumed the post of chairman (January 1949). In 1945 he was appointed a U.S. delegate to the San Francisco Conference which chartered the United Nations, the next year served as an alternate delegate at the first meeting of the U.N. Assembly in London, and in 1947 attended the Inter-American Defense Conference at Rio de Janiero. Most important of the books Bloom wrote were "The Story of the Constitution" (1937), "Our Heritage" (1944) and "The Autobiography of Sol Bloom" (1948). He died on March 7, 1949.

Courtesy Capitol Photo Service, Wash., D. C.

SOL BLOOM

Bloomer (*blo͞om'ẽr*), AMELIA, dress reformer, born in Homer, N.Y., May 27, 1818; died Dec. 29, 1894. Her maiden name was Amelia Jenks and she married Dexter C. Bloomer in 1840. For some time she lived at Seneca Falls, N.Y., where she published *The Lily,* a periodical devoted to various social reforms. She advocated woman suffrage, temperance, and the so-called *bloomer costume*. In 1855 she removed to Council Bluffs, Ia., where she resided until her death. She is not the originator of the costume named from her, but received the idea from Elizabeth Smith Miller and joined Lucy Stone and Elizabeth Cady Stanton in adopting it. This costume consists of a jacket with coat sleeves, a skirt extending a little below the knees, and loose trousers gathered in bands a little above the ankle.

Bloomfield (*blo͞om'fēld*), a manufacturing city of New Jersey, in Essex County, 5 m. N.W. of Newark, on the Erie and the Lackawanna Railroads. It is situated on the Morris Canal and has a large trade in merchandise and produce. The chief buildings include the Jarvie Library, the Westminster and First Presbyterian churches, and the German Theological Sem. of Newark. The manufactures are paper, ironware, machinery, textiles, cigars, and musical instruments. Bloomfield was settled in 1675 and was incorporated in 1812. Population, 1940, 41,623; in 1950, 49,307.

Bloomfield-Zeisler, FANNY, pianist, born in Bielitz, Austria, July 16, 1863. In 1868 she came to Chicago, Ill., with her parents. Later she studied under Leschetizky. In 1885 she played in the greatest musical centers of Europe. She toured England and Germany in 1898, France in 1902, and the leading cities of America in 1903 and 1905. Her eminent success easily won for her the distinction of being the leading pianist in her time. She died in 1927.

Bloomington (*blo͞om'ĭng-tŭn*), county seat of McLean County, Illinois, 125 m. s.w. of Chicago, on the Illinois Central, the Gulf Mobile & Ohio, and other railroads. It is located on the highest land in the state and almost in the geographical center. It is surrounded by a rich agricultural country. The county courthouse, the public library, the city hall, and the central high school are among the chief buildings. It is the seat of the Illinois Wesleyan Univ., and at Normal, 2 m. north, are the State Normal Univ. and the State Soldiers' Home. The city has large railroad shops, electric household utilities, oil burner, candy, mattress, and fruit-canning enterprises, and foundries. Bloomington was settled in 1831 and was incorporated in 1850. Population, 1950, 34,163.

Bloomington, county seat of Monroe County, Indiana, 50 m. s.w. of Indianapolis, on the Illinois Central and the Monon Railways. The chief buildings include the county courthouse, the central high school, and the Indiana State Univ. Among the manufactures are leather goods, furniture, plate glass and mirrors, machinery, and clothing. In its vicinity are productive limestone quarries. It was settled in 1818. Population, 1950, 28,163.

Bloomsburg (*blo͞omz'bẽrg*), a town of Pennsylvania, county seat of Columbia County, 60 m. s. of Scranton, on the Reading, the Lackawanna, and Pennsylvania railroads. It is situated on the Susquehanna River. The surrounding country has agricultural and dairy interests. Manufactures include carpets, textiles, cars, and car wheels. The town is the seat of a state teachers college. Population, 1940, 9,799; in 1950, 10,633.

Blouet (*bloo̅-ē′*), PAUL. See *O'Rell, Max.*

Blount (*blŭnt*), WILLIAM, politician, born in North Carolina, March 26, 1749; died in Knoxville, Tenn., March 21, 1800. After serving in the American Revolution, he was a member of post-Revolutionary Congresses (1782-83; 1786-87) and a delegate to the Constitutional Convention of 1787. In 1790 he was made governor of a trans-Allegheny region. In 1796 he became first U.S. Senator from the newly formed state of Tennessee. In financial difficulties through western land dealings, he tried to aid the British to gain control of Spanish Florida and Louisiana, for which he was expelled from the U.S. Senate. However, he was elected to the Tennessee state senate in 1798 and later became its speaker.

Blow (*blō*), SUSAN ELIZABETH, educator, born in St. Louis, Mo., June 7, 1843, died in New York City, March 26, 1916. A student of transcendental philosophy, she became interested in the educational theories of Froebel (*q.v.*), and when she decided to open a kindergarten (*q.v.*) she studied German methods in New York under Mme. Maria Kraus-Boelte. In 1873 she opened the first public kindergarten in the Des Pères School of Carondelet, a suburb of St. Louis, and in 1874 opened a training school which gained significance in the history of American education.

Blowfly (*blō-flī*) or FLESH FLY, a type of large fly, usually green or dark blue, which lays its eggs upon meat or dead animals. The eggs hatch in from 20 to 24 hours, and the young larva buries itself into the flesh for two weeks; it then transforms into the pupa stage, and develops into the matured blowfly about two weeks later. The eggs are called *fly blows* and are invariably laid on the lean meat. While in the larva stage the insects are known as *maggots* and play an important part in the removal of decaying carrion.

Blowpipe (*blō′pīp*), a small, conical tube of metal, usually bent, arranged in such a way that by blowing with the mouth into one end a thin jet of air from the other end can be made to impinge on a flame, such as a candle or gas flame. A thin stab of flame, very hot because of the increased oxygen supply, is blown out from the side of the main flame. Blowpipes are used by jewelers and gold- and silversmiths to melt a piece of gold or silver. Blowpipes are of great antiquity; an ancient Egyptian painting found at Thebes shows a man using one. They are sometimes used by chemists to identify the composition of an unknown substance, which they place on a block of charcoal and observe as it changes under a blowpipe flame.

Blücher (*blü′ker*), GEBHARD LEBERECHT VON, nicknamed *Marschall Vorwärts* (Marshal Forward), soldier, born in Rostock, Germany, Dec. 16, 1742; died in Silesia, Sept. 12, 1819. Entering Swedish service at the age of 14, he was captured by the Prussians in the Seven Years' War and in 1761 entered the Prussian army. He commanded forces against the French in the Rhine battles (1793-94) and at Auerstedt (1806). Later taken prisoner, Blücher was exchanged for the French general Claude Victor. In 1813 he defeated the French under Macdonald at Katzbach and under Marmont at Möckern; in 1814 he invaded France. On June 18, 1815, his flank attack on Napoleon's forces decided the Battle of Waterloo (*q.v.*). After Napoleon's exile to St. Helena, Blücher retired to Krieblowitz, an estate in Silesia earlier presented to him by Frederick William III. The blucher boot and shoe were named for the marshal.

Blücher or BLUECHER, VASILI KONSTANTINOVICH, the assumed name (real name unknown) of a Russian general who was born in 1899. He fought as a common soldier in World War I, took part in the Bolshevik Revolution (1917) and fought against the Czarist forces under Kolchak and Wrangel (1919-20). He commanded (1921-22) forces in the Russian Far East, driving the Japanese from Vladivostok in 1922, and was (1924-27) military adviser to the Kuomintang in Canton. As Gen. Galen or Ga-lin, he aided Chiang Kai-shek in Chiang's northern campaign (1926-28). Returning to Moscow when Chiang repudiated the Communists, he was given a Red Army command in eastern Siberia. Although credited with contributing much to the development of Khabarovsk Territory, he was mysteriously dismissed in 1938 and subsequently disappeared.

Blue (*bloo̅*), one of the seven colors into which white light may be broken by refraction through a prism; namely, that band of the spectrum falling between the wave lengths 467 to 481.5 millimicrons, particularly 478.5 millimicrons. The color blue may be observed at the zenith of the clear sky. It is one of the three physiological primaries (red, blue, and green), and one of the six psychological primaries (those hues in terms of which all other colors may be described—red, yellow, green, blue, black, and white). On the spectrum of Newton, it lies between indigo and green.

Blue Baby. See *Cyanosis.*

Bluebeard (*bloo̅′bērd*), the name of a tale written by Charles Perrault (*q.v.*), *ca.* 1697, translated into English in the 18th century. The main character *Raoul,* who possesses an unusual blue beard, is the wealthy husband of *Fatima,* a neighbor's daughter. Shortly after their marriage, he leaves her alone in their castle while he travels, cautioning her to stay out of one of the rooms. Curious, she opens the door and, startled to find the bodies of his six former wives, drops the room key in a pool of blood. Unable to clean it, she cannot deny her action when Bluebeard returns. Ready to kill her, he grants her a short time to pray. Fatima secretly sends her sister to the castle's tower to signal their two brothers, who arrive in time to save her from her husband.

A figure similar to Bluebeard appears in the folk tales of several countries; he is also the central character of a play and of an opera, *"Barbe Bleue,"* by Offenbach.

Bluebell (*blōō'bĕl*), the common name for several perennial wild flowers generally widespread in the North Temperate Zone. The bluebell of Scotland is more properly known as the harebell (*q.v.*). See also *Campanula.*

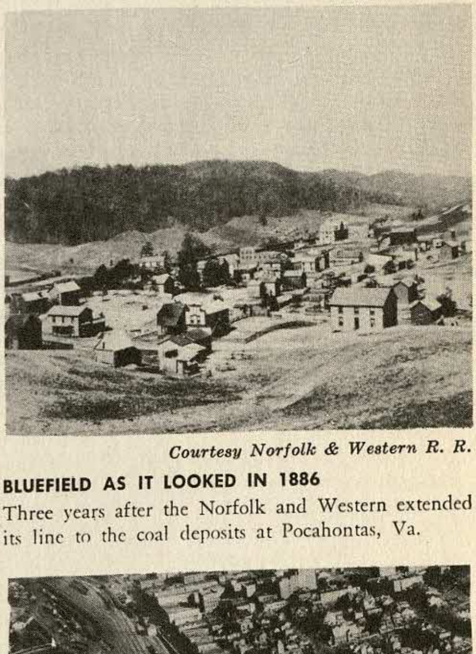
Blueberry (*blōō'bĕr-i*), the name of a kind of berry and of the bushes which produce them (*Vaccinium*), native in North and South America. The genus, which also includes cranberries, belongs in the heath family. From several North American species, large crops of small, sweet, blue or blackish berries are harvested every year, chiefly from wild plants. Since 1908, cultivated varieties, with berries up to and inch in diameter, have been developed. All require acid soil. The leaves of blueberries are small, elliptic, and undivided. The flowers are small, whitish, and bell-shaped. Blueberries are often called huckleberries, but this name is more accurately given to another genus of heaths, *Gaylussacia,* in which the berries are usually black and often very seedy (see also *Huckleberry*).

Bluebird (*blōō'bĕrd*), a well-known American bird (*Sialia sialis*) whose bright colors, gentle behavior, and plaintive song have made it a favorite. Somewhat smaller than the American robin to which it is related, it is sky-blue above, reddish brown on the breast, and white on the median lower under parts; females have duller colors. It is found east of the Rocky Mts. from southern Canada to Florida and Arizona and south to Honduras. It is resident in Bermuda and accidental in Cuba. It leaves the most northern regions in the fall but winters in small numbers as far north as southern Michigan and southern New England.

Bluebirds are friendly to man and nest readily in boxes near houses and outbuildings. Their natural nesting sites are in holes in trees, and old deserted orchards are among their favorite haunts. The pale blue eggs are four to six in number. Two and sometimes three broods are raised each season.

Bluebonnet (*blōō'bŏn-ĕt*), the state flower of Texas, botanically *Lupinus texensis,* in the pea family. It is a low-growing annual, with a silky, hairy covering on its stems and leaves. The leaves have five leaflets, attached to the end of the leaf stalk. The individual flowers, each blue with a white spot, grow in small clusters. Bluebonnet has also been called buffalo clover and has considerable value as cattle forage.

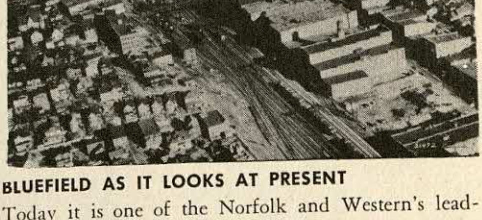
Bluefield (*blōō'fēld*), the name of two communities, one on each side of the Virginia-West Virginia boundary. Bluefield, W.Va., the larger of the two, is a railroading city and coal distributing center located in Mercer County, *ca.* 70 m. w. of Roanoke, on the Norfolk and Western R.R. It manufactures electrical and mining equipment, mattresses, and flour and is the seat of Bluefield State Teachers Coll. Adjoining it is Bluefield, Va., also part of the coal area, in Tazewell County. Population, Bluefield, W.Va., 1950, 21,506; Bluefield, Va., 1950, 4,212.



Courtesy Norfolk & Western R. R.

BLUEFIELD AS IT LOOKED IN 1886

Three years after the Norfolk and Western extended its line to the coal deposits at Pocahontas, Va.



BLUEFIELD AS IT LOOKS AT PRESENT

Today it is one of the Norfolk and Western's leading cities on the Pocahontas Division

Bluefish (*blōō'fish*), a voracious, migratory food fish (*Pomatomus saltatrix*) common off the coast of North America. A bluefish weighs between 3 and 15 lb. and is characterized by greenish or bluish upper parts and white lower parts. Bluefish travel in dense schools of similar-sized fish up and down the Eastern seaboard, seeking the smaller fish on which they feed. They often destroy more than they can eat. The pollack (*q.v.*) is sometimes called the Boston bluefish.

Bluegrass (*blōō'grăs*), a genus of grasses (*Poa*), particularly Kentucky bluegrass (*Poa pratensis*), a perennial grass found in temperate regions of America, Europe, and Asia. It has a rough and rather short and slender stalk and dark-green foliage. It is highly valued as pasturage and has flourished so prolifically in Kentucky as to give that state the name of Bluegrass State. The hay cut from bluegrass is of fine quality.

Blue Island, a city of Illinois, in Cook County, *ca.* 15 m. s. of central Chicago, situated on the Calumet-Sag Canal and on the Chicago, Rock Island and Pacific, the Illinois Central, the Grand Trunk, and other R.R.'s. Primarily a residential suburb for many employed in Chicago, it is also the site of freight yards, railway repair shops, brickyards, steel and wire products factories, and canning plants. Originally known as Portland, Blue Island was settled about 1835 and incorporated in 1872. Population, 1950, 17,622.

Blue Jay. See *Jay.*

Blue Laws, the name often applied to laws adopted in the middle of the 17th century for the early colonists of New England. Because they were so stringent in their regulations of social life, they aroused much opposition among the more liberal colonists. The term is now applied to any legislation aimed at interference with the personal and domestic liberties of an individual. Among the blue laws of New England were those prohibiting a mother from kissing her child on the Sabbath or on a fasting day. They provided a penalty for shaving on the Sabbath, imprisonment for married persons not living together, a penalty for furnishing food or lodging to a Quaker, imprisonment for debt, and a long list of other similarly severe measures.

Blue Mountains, a range of mountains, also known as Blue Plateau, in New South Wales, Australia, the highest point of which is 4,460 ft. above sea level. The same name is applied to a range of mountains in the eastern part of the island of Jamaica, British West Indies, which includes peaks nearly 8,000 ft. high. Another range of the same name are the Blue Mts. in Pennsylvania, New Jersey, and New York, more popularly called the Kittatinny Mts. A range in Oregon and Washington, also known as the Blue Mts., has a culminating peak reaching 9,097 ft.

Blue Nile (*nīl*), a branch of the Nile River in northeastern Africa. It drains Lake Tana in northern Ethiopia and joins the White Nile at Khartoum in the Sudan. See *Nile.*

Blue Point, a type of oyster (*q.v.*) cultivated in beds off the shore of Blue Point, Long Island. Their flavor and textural characteristics make them particularly suitable for eating raw.

Blueprint (*blōō'prĭnt*), a reproduction made by the blueprint process, or by related processes. In such a process, a line drawing on translucent paper is placed over special, sensitive paper and exposed to an arc or mercury-vapor lamp. The sensitive paper has been previously coated with ferric ammonium citrate and potassium ferricyanide. Where it is exposed to light, the ferric iron is partially reduced to ferrous iron; on the addition of water, a blue color (Turnbull's blue) is produced. Under the lines the paper stays light. Positive blueprint or cyanotype paper is also available, where, by varying the chemical, blue lines on a white ground are obtained. Blueprints are much used for engineering drawings, since numerous copies can be made with little cost.

Blue Ribbon Jury or PANEL. See *Jury.*

Blue Ribbon of the Atlantic, an honor awarded to the ocean liner which makes the fastest crossing of the North Atlantic. The current record is held by the *United States,* which made the west-to-east crossing in 3 days, 10 hours, and 40 minutes on its maiden voyage in July 1952. See *Speed and Distance Records.*

Blue Ridge, the most easterly range of the Appalachian Mts., extending from the Maryland border southwest through Virginia, West Virginia, North Carolina, and northern Georgia, where it ends. The highest peak, in North Carolina, is Mt. Mitchell (6,684 ft.). The range is famed for its scenic highways, the Skyline Drive and the Blue Ridge Parkway. During the Civil War it was the scene of important battles.

Blues (*blōōz*), a form of jazz music, generally melancholic in mood and characterized by a three-stanza, twelve-bar form, in which the first two lines are closely similar, with frequent introduction of dissonant or indeterminate chords. Growing out of the "field hollers" and work songs of the southern American Negroes, and essentially a vocal expression, the blues first came to popular attention through the publication of the orchestrations of W. C. Handy, *ca.* 1909. In 1924 imitative incorporations of blues forms appeared in George Gershwin's well-received "Rhapsody in Blue," and since then blues influences have appeared in numerous symphonic works, as well as in the productions of Tin Pan Alley. Probably the best known, if not most typical, blues is W. C. Handy's "St. Louis Blues."

Blue Sky Laws, regulations for the sale of stocks, bonds or other securities for protection of the public against irregularities. First enacted in Kansas in 1911, and later in other states, these laws derived their name from a remark made by the proposer of the laws that some companies selling stocks and bonds were trying to capitalize on the blue skies. See *Securities and Exchange Commission.*

Bluffton (*blŭff'tŏn*), county seat of Wells County, Ind., 25 m. s. of Ft. Wayne, on the New York, Chicago and St. Louis R.R. The principal industries include pump factories, foundries, machine shops, a piano factory, clay products, sanitary sewers, and asphalt paving. Bluffton was settled in 1837 and incorporated in 1849. Population, 1940, 5,417; in 1950, 6,076.

Blum (*bloom*), LÉON, ex-Premier of France, born in Paris, April 9, 1872; died there, March 30, 1950. A law graduate of Paris Univ. (1894), he was appointed to the Council of State (1895) and elected Deputy of Paris (1919). Leader of the Socialist party, he became the guiding spirit of the Popular Front, a fusion of leftist, labor, and progressive elements in French politics, and he was twice premier (1936-37, 1938) of such a coalition government.

His reforms effecting important social gains brought in their wake a devaluation of the franc. In addition to this handicap, Blum's governments were overshadowed by the menace of Hitler Germany, the Spanish Civil War, and British reluctance to go to the limit of her possibilities in forming a united front with France. Blum was arrested in 1940 by the government of Marshal Pétain, allegedly for neglect of duty when premier, and was held in a German prison, 1943-45. Returning to his native country, Blum resumed leadership of the Socialist Party. In 1946, Blum was temporarily made ambassador extraordinary to foreign countries, his special duty being a visit to the U.S. in 1946, to negotiate a loan for France.

Thereafter Blum's official duties were manifold: He presided over the first general conference of the U.N. Educational, Scientific, and Cultural Organization, meeting in Paris in 1946, and served about one month as premier late in 1946. In July 1948 he accepted the office of vice premier in the government of Premier André Marie. Until his death he continued to be a dominant figure in the French Socialist party.

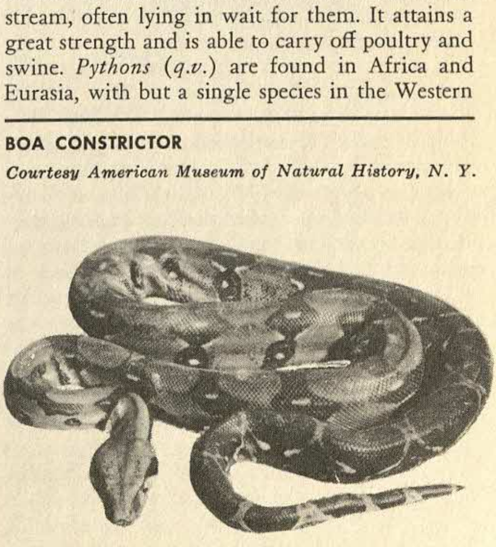
Blushing (*blŭsh'ĭng*), a sudden reddening of the face, due to a rush of blood into the capillary vessels of the skin. The cause is chiefly mental confusion, which results from surprise or apprehension, especially when accompanied by a feeling of modesty or shame. Sudden passion or emotion influences the nervous system so as to permit a temporary enlargement of the capillaries. These then permit the entrance or passage of more blood than ordinarily, giving the cheeks a flushed or reddish appearance. On the other hand, fear and terror cause the face and lips to become pale by exciting the nerves so that they cause the capillaries to contract, thus diminishing the flow of blood.

B'nai B'rith (*b'nā b'rēth*) (Hebrew *Sons of the Covenant*), oldest and largest Jewish service and fraternal organization in the U.S. Founded 1843; membership in this country and Canada, 1950, was 345,000 (205,000 in men's lodges, 115,000 in women's chapters, 25,000 in B'nai B'rith Youth Organizations). Lodges also exist in more than a score of foreign countries. The aims of the organization are: defense of Jewish rights, charitable and relief work, civic and communal welfare, war service and Americanism, adult and youth education, cultural and religious activities among Jewish college youth, and vocational service and guidance for Jewish youth and adults. National headquarters are located at Washington, D.C.

Boa (*bō'ȧ*), any member of a subfamily of serpents (the *Boinae*), including the *boa constrictor* and the *anaconda.* All boas kill their prey by constriction, swallowing it whole. Like other snakes, they are equipped with jaws so constructed that the mouth may be dilated sufficiently to enable them to swallow bodies much thicker than themselves. The *boa constrictors* attain a maximum length of 18½ ft. These snakes are devoid of fangs. They have a reddish-gray color with broad stripes on the head, and the body is covered with small scales. Their food consists chiefly of small quadrupeds. The true boas are found throughout tropical America with representatives in Europe, Asia, Africa, and Madagascar. Some species inhabit dry localities, others dense forests, while others frequent banks of lakes and streams, often living partly in the water. The water boa, which is known as the *anaconda,* attains a length of fully 28 ft. It feeds on fish and animals that come to the banks of the stream, often lying in wait for them. It attains a great strength and is able to carry off poultry and swine. *Pythons* (*q.v.*) are found in Africa and Eurasia, with but a single species in the Western

BOA CONSTRICTOR

Courtesy American Museum of Natural History, N. Y.



Hemisphere. They are closely related to the boas. See also *Snakes.*

Boadicea (*bō-ȧ-dĭ-sē′ȧ*), "the British Warrior Queen," a queen of Britain in the time of the Roman Emperor Nero, wife of Prasutagus, King of the Iceni; he governed the portions of England now occupied by the counties of Suffolk and Norfolk. At the death of her husband she inherited his accumulated goods and money. The seizure of this treasure by the Romans caused a protracted war. The Britons commanded by Boadicea destroyed about 70,000 Romans, but met defeat in the year 62 A.D. Rather than be taken captive, she took poison.

Boar (*bōr*), the name applied to either sex of the wild swine found in Africa, Asia, and Europe. These animals attain about the same size as the domestic hog, which is thought to have descended from the wild boar. They have coarser bristles and larger tusks than the domestic stock, and are vicious when attacked. In the swamps of Turkestan they abound in large numbers and in size exceed those of Africa. In Europe they are found chiefly in the forests under government protection. The flesh of the wild boar is edible, and some regard it as superior even to that of the domestic swine, as the animal feeds mostly on fruits and roots and is cleaner in its habits. The wild boar of India is a favorite animal of the chase and is pursued by mounted men, who look upon *pig-sticking* as a favorite sport. A small herd of these animals, originally imported from Europe, run wild and are hunted in the southern Appalachian Mts.

Boardman (*bōrd′mạn*), GEORGE DANA, clergyman, born in Burma, Aug. 18, 1828; died April 28, 1903. After his graduation from Newton Theological Inst. (Mass.), he became a minister in Rochester, N.Y., and later in Philadelphia. He attained considerable prominence by his many able essays and addresses against slavery. His works include "The Kingdom," "The Golden Rule," and "The Disarmament of Nations." His father, GEORGE DANA BOARDMAN (1801-31), was a prominent American missionary in Burma.

Board of Trade (*bōrd of trād*), or CHAMBER OF COMMERCE, an association of traders, merchants, or persons engaged in commercial pursuits to promote trade by a union of action, or attain advantages in trade by combinations which are beyond the reach of individuals acting separately. The first board of trade was established at Marseilles, France, and it was promoted partly for political advantages as well as to stimulate trade. The Chamber of Commerce organized in Paris in 1700 corresponded to similar institutions in other cities of France. In London, the Chamber of Commerce is the center of a general trade, while similar organizations at Liverpool, Hull, Leeds, and Manchester exercise a marked influence on the commerce of Great Britain. Associations in the interest of industry, banking, transportation, trade, etc., are maintained in Germany under governmental control. At present such organizations can be found in almost every country. Among the larger chambers of commerce in the U.S. are those of New York, Chicago, Boston, Baltimore, Philadelphia, St. Louis, and San Francisco. The leading boards of trade of Canada are at Montreal, Toronto, Quebec, Winnipeg, and Vancouver.

Boas (*bō′ăz*), FRANZ, anthropologist, born at Minden, Germany, July 9, 1858; died in New York City, Dec. 21, 1942. He came to the U.S. (1886) and became instructor in anthropology at Clark Univ. (1888-92), and professor at Columbia Univ. (1899-1937). As curator of the American Museum of Natural History (1901-05), he directed the Jesup North Pacific Expedition. His explorations took him also to Baffin Land, Mexico, Puerto Rico and Northwestern America.

An authority on anthropometry and the languages of North American tribes, he wrote "The Mind of Primitive Man" (1911), "Race, Language and Culture" (1940), and many other monographs in his special field.

Boat (*bōt*), a small open vessel, propelled by oars or paddles, sails, or by steam, gasoline, or diesel engines. Although the term is frequently used with reference to any sea or river craft, it is applied nautically to small craft that may be hauled aboard a larger vessel, or that may be launched from a beach. Types of boats vary according to their design, purpose, or method of propulsion. See also *Barge; Lifeboat; Pinnace; Rowing; Ship; Yacht.*

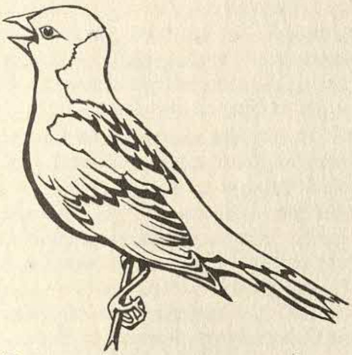
Boatbill (*bōt′bĭl*), a bird of the heron family, native to Central and South America. It was so named from the large bill, which is broad and shaped somewhat similar to an overturned boat. The lower mandible has a pouch to retain food. This bird frequents marshy places and the banks of rivers. It often perches on trees overhanging water, whence it darts to catch fish, crustacean animals, and reptiles for food.

Boatswain (*bō′s′n*), minor officer of a vessel, whose duties include piping the crew to their posts with his whistle, charge of the anchors, ropes, etc.

Boaz (*bō′ăz*), in the Old Testament, a wealthy man of Bethlehem, who married the Moabite woman, Ruth (Ruth 4:10). King David was a fourth-generation descendant of Ruth and Boaz.

Bobbin (*bŏb′bĭn*), a small spool or roller used in spinning. At each end is a flange or border, and its axis is pierced to receive a pivot. The bobbin used in weaving has a flange on one end only, but the small metallic bobbin which holds the thread in the shuttle of a sewing machine has a flange on both ends. The common spool on which thread is wrapped is an example of a wooden bobbin.

Bobolink (*bŏb'ō-lĭnk*), a migratory bird of America. It is seen most frequently in the southern part of the U.S., whence it passes northward in summer and to the West Indies and south in the winter. It is known in various sections as *ricebird, reedbird,* and *ricebunting.* The bobolink feeds on rice and other cereals, and is extensively used for food. In the Carolinas and other states of the South it is dreaded on account of its ravages in the fields of rice. When passing north from the rice fields of the South to the section farther north and to Canada, it is rich with fat and almost incapable of enduring long flights. The male is mostly black, sprinkled with white and yellow, and the female is largely marked with shades of brown. The song of the male is merry, quick, and musical.

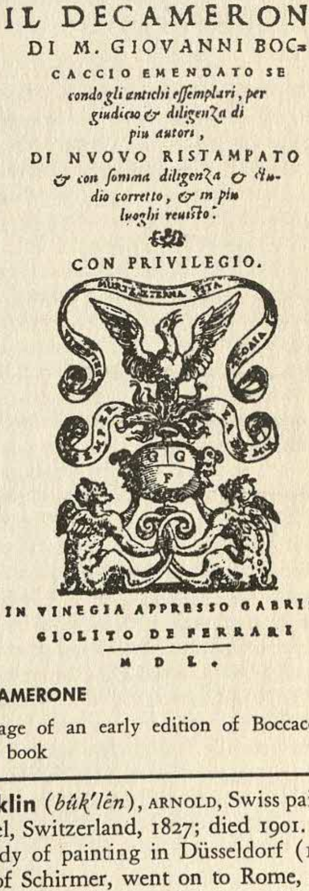


BOBOLINK

Bobsledding (*bŏb'slĕd-ĭng*), the sport of coasting over the snow on a sled or sleigh formed of two sleds arranged one behind the other. The sled in front is usually pivotal. See also *Lake Placid.*

Boccaccio (*bōk-kä'chō*), GIOVANNI, famous Italian novelist and poet, born in Paris, France, in 1313; died at Certaldo, Italy, Dec. 21, 1375. He was the son of a Florentine merchant and a French woman, studied canon law, and devoted himself to literature. He fell in love with Maria, daughter of King Robert of Anjou, in 1331, whom he made famous in poetry and stories under the name of *Fiammetta.* Among his best-known writings are: "Il Filocopo" and "Tesside"; the latter was the first heroic epic in the Italian language. However, his fame rests on the work "Decameron," which consists of 100 tales purporting to have been related in equal proportions in 10 days by a party of ladies and gentlemen near Florence, while the plague was raging in that city. Many writers have drawn plots for romances and novels from this celebrated work of Boccaccio. In 1373 he was chosen to the professorship established at Florence in memory of Dante for the exposition of the "Divina Comedia," which position he held until his death. He was a close friend of Petrarch, with whom he was associated many years.

Bochum (*bō'kōōm*), a city of Germany, in the province of Westphalia, 30 m. N.E. of Düsseldorf. It is surrounded by a coal-producing country and is the seat of extensive iron and steel works. The general manufactures include woolens, hardware, machinery, cigars, and paper hangings. Bochum is a modern city and its growth is due to the development of its manufacturing enterprises, primarily iron and steel works. Population, *ca.* 350,000.

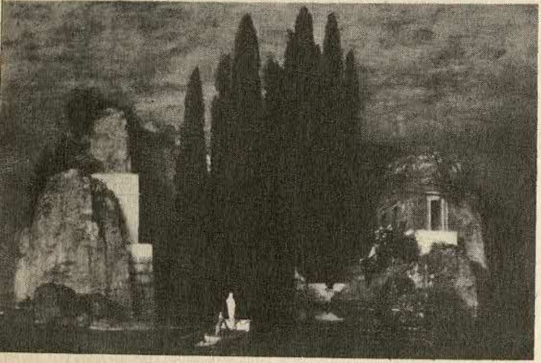


IL DECAMERONE
DI M. GIOVANNI BOC-
CACCIO EMENDATO SE
condo gli antichi eſſemplari, per
giudicio & diligenza di
piu autori,
DI NVOVO RISTAMPATO
& con ſomma diligenza & ſtu-
dio corretto, & in piu
luoghi reuiſto.
CON PRIVILEGIO.
IN VINEGIA APPRESSO GABRIEL
GIOLITO DE FERRARI
M D L.

IL DECAMERONE

Title page of an early edition of Boccaccio's world famous book

Böcklin (*bûk'lĕn*), ARNOLD, Swiss painter, born in Basel, Switzerland, 1827; died 1901. He began his study of painting in Düsseldorf (1845) as a pupil of Schirmer, went on to Rome, and Paris, later dividing his time between Germany and Italy. Böcklin's early interest in landscape painting revealed a preference for idyllic landscapes rather than conventional scenes. His paintings of Italian or fantastic scenery depicting antique ruins and temples are often enlivened by mystical and fairylike figures, and represent a typical romantic school of painting. He is well represented in museum collections and one of his best known works, "The Isle of the Dead," dealing with a theme frequently repeated in his work, hangs in the Metropolitan Museum of Art, New York.



Courtesy Metropolitan Museum of Art, N. Y.

ISLE OF THE DEAD. PAINTING BY ARNOLD BÖCKLIN

Bodanzky (*bô-dänz'kў̆*), ARTUR, Metropolitan Opera conductor, born in Vienna, Austria, Dec. 16, 1877; died, Nov. 23, 1939. He began the study of violin as a child, and after high school entered the Vienna Conservatory. Before he was 20 he was a member of the Society of Friends of Music Orchestra, which has had among its conductors, from time to time, such great musicians as Brahms, Rubinstein, and Saint-Saëns. Under the influence of Mahler, Bodanzky shifted from the violin to conducting and had his first engagement as a conductor at the State Theater in Budweiz, Bohemia, in 1900. He left that post to become Mahler's assistant at the Imperial Opera House in Vienna (1902), and after two years was chosen to direct the Paris debut of "Die Fledermaus" (1904). The success of the performance opened important posts to Bodanzky, and he conducted in Vienna, Berlin, Prague, and Mannheim before coming to the U.S. in 1915 as the principal conductor of German opera at the Metropolitan Opera House. The following year, he also became conductor of the N.Y. Society of Friends of Music, a post he held until his death. During his years at the Metropolitan, he introduced nine operatic works, and edited such well-known works as Weber's "Oberon," and Beethoven's "Fidelio."

Bode (*bō̆'dẹ*), JOHANN ELERT, astronomer, born in Hamburg, Germany, Jan. 19, 1747; died at Berlin, Nov. 13, 1826. He became devoted to the study of mathematical sciences and astronomy at an early age. He made a telescope for himself in the garret of his father's house, which he used as an observatory to study the heavens. At the age of 18 he successfully calculated an eclipse of the sun, and in 1766 published his first treatise on the solar eclipse. In 1772 Frederick II called him to Berlin and appointed him professor of astronomy in the Acad. of Sciences. His long and faithful work in that institution was the means of adding much of value to the fund of astronomical knowledge. His works include: "Astronomical Almanac" and "Celestial Atlas." The latter contains a catalogue of 17,240 stars. A mathematical formula known as Bode's Law, by which the distance of planets from the sun may be approximately expressed, owes its discovery to him. However, some ascribe the discovery of this law to Titus of Wittenberg.

Bodin (*bô-dăn'*), JEAN, political economist, born in Angers, France, 1530; died at Laon, 1596. He studied law, and later held several offices with Henry III of France, retiring in 1584 to devote himself to writing. A gifted political writer, he produced his most important work in "The Republic" (1576).

Bodleian Library (*bŏd'lē-ạn*), the library of Oxford Univ., England, restored by Sir Thomas Bodley in 1598 and opened in 1602. For rare collections it is excelled only by a few of the great libraries, although it is surpassed greatly in that respect by the Vatican in Rome. In it are copies of all the works published in Great Britain, and in addition to the English publications it contains numerous works issued in other countries. At present there are about 1,500,000 volumes.

Bodoni (*bô-dō'nē*), GIAMBATTISTA, printer and type designer, born in Saluzzo, Italy, Feb. 16, 1740; died in Parma, Nov. 23, 1813. He worked as a compositor in the Vatican before going to Parma to head the duke of Parma's private printing house, which he made into the finest in Europe. A brilliant type designer, Bodoni was one of the originators of the so-called modern type face, and many of his faces are still used in modified form. Among his greatest accomplishments were editions of Homer and Vergil and "The Lord's Prayer" in many languages. Specimens of his large collection of types are contained in a two-volume *"Manuale Tipografico"* published in 1818.

See also *Typography.*

Boehm (*bām*), MARTIN. See *Evangelical United Brethren Church.*

Boehmeria (*bē̃-mē̃'rĭ-ȧ*), a genus of plants native to China and the East Indies, important for the tough fiber used in making twine and rope. The plants belonging to this genus are related to the nettle, but do not possess the stinging properties. They yield the valuable rhea fiber, or grass-cloth fiber, known in commerce as *ramie.* The species from which this product is obtained principally is the Chinese grass. This plant is perennial, grows best in shade and moisture, and yields three crops in a season, new shoots coming up after each harvesting. It is cultivated in the southern part of the U.S. and the warmer parts of Europe. Species known as false-nettles are annual plants and grow as weeds in Canada and the U.S.

Boeotia (*bê-ō'shĭ-ȧ*), one of the ancient divisions of Greece, situated south of Phocis and west of the Euboean Sea, and now united as a province with Attica. The two as now organized contain an area of 2,475 sq. m. Boeotia has an area of 1,635 sq. m. It was one of the most progressive and celebrated divisions of ancient Greece, and is noted as the birthplace of the historian Plutarch, the general Epaminondas, and the poets Hesiod and Pindar. It was the seat of 14 cities that formed the Boeotian League. The surface is quite level, but near its boundaries are chains of mountains. In the time of Alexander the Great a vast tunnel was constructed through the mountains to drain the district of the interior that was subject to overflow by the waters of the Cephissus, which discharges into Lake Copais, but later it became damaged and failed to discharge the water, thus rendering the district marshy and unhealthful. Extensive canals and tunnels were made in 1886, and now the district is productive.

Boer (*bōr*), a Dutch word meaning farmer or husbandman, used to designate South Africans who descended from Dutch, German, and French Huguenot settlers. Calvinists by religion, the Boers developed a provincial society of caste and even tyranny. Chiefly interested in raising livestock, they carved out vast ranges for their herds of cattle and sheep. Since British colonial policies were never popular with the Boers, after 1834 many made "the Great Trek" northward and formed independent communities in Orange Free State, the Transvaal, and Natal (*qq.v.*). After their defeat in the Boer War (*q.v.*) and the establishment (1910) of the Union of South Africa (*q.v.*), the Boers demonstrated intense nationalism. They began calling themselves Afrikanders, or Afrikaners, and developed their own language, Afrikaans. See also *South Africa, Republic of.*

Boerhaave (*bōōr'hä-vȩ*), HERMANN, physician and scientist, born in Voorhout, near Leyden, Holland, Dec. 31, 1668; died in Leyden, Sept. 23, 1738. After receiving a degree in medicine (1693) at Harderwyck in Guelderland, he began to teach medicine (1701) and botany (1709) at the Univ. of Leyden. Appointed rector and professor of practical medicine in 1714, he soon introduced the modern system of clinical teaching. In 1718 he assumed the chair of chemistry. Under his guidance, the university became Europe's leading medical school. Boerhaave contributed to the science of botany by improvements in the botanical garden of Leyden and by publishing descriptions of new species of plants. His principal works are *"Institutiones medicae"* (Institutes of Medicine, 1708) and *"Elementa chemiae"* ("Elements of Chemistry," 1724).

Boer War or SOUTH AFRICAN WAR, a war waged from 1899 to 1902 by Transvaal and Orange Free State (*qq.v.*) against Great Britain for the supremacy of South Africa. Great Britain annexed the Transvaal in 1877, and despite the restoration of self-government in 1881, the Boers still resented British colonial policy. Bloody sorties occurred during 1880-81, and in 1883 Transvaal declared her independence as the South African Republic. The discovery of gold in the Witwatersrand (1886) brought an influx of immigrants (*uitlanders*), many of whom were English. Relations between the *uitlanders* and the government of Pres. S. J. P. Kruger (*q.v.*) steadily deteriorated. In 1895 Great Britain's Cape Colony (*q.v.*) mounted the abortive Jameson Raid to support a *uitlander* rebellion, which also failed. After the collapse of negotiations (1899) between the republic and Great Britain, British troops were sent to the Transvaal border. On Oct. 11, 1899, the Boer republics declared themselves in a state of war with Great Britain, and on the following day they attacked Cape Colony.

The Boer army totaled *ca.* 50,000 men—expert marksmen and horsemen who knew the terrain well. They quickly won impressive victories from the initial British force of 27,000 men. In Cape Colony, Kimberley was besieged and Mafeking taken by Gen. Piet A. Cronje. In Natal (*q.v.*), much of which the Boers captured, the town of Ladysmith was besieged by Gen. Petrus J. Joubert, and the British were defeated at Magersfountein, at Colense on the Tugela River, and at Spion Kop. Not until February 1900, when Great Britain supplied *ca.* 100,000 more men, did the tide turn. The sieges were ended, although the rescue of Ladysmith's 22,000 inhabitants and its garrison cost 1,600 lives. At Paardeberg the British captured Cronje and 4,000 Boers. With Lord Kitchener as chief of staff and Gen. Frederick S. Roberts as commander in chief, the British invaded the Orange Free State. Bloemfontein, the capital, fell in March, and in May the territory was annexed. In the same month the siege of Mafeking was relieved, the Transvaal invaded, and Johannesburg captured. Pretoria, capital of Transvaal, was occupied in June, but not until August was the Boer force under Gen. Louis Botha finally defeated at Bergendal. The Transvaal was declared a British colony in September.

Meanwhile the Boers had begun guerrilla warfare, and Kitchener decided to sweep the guerrilla areas bare of livestock, food, and people. Boer women and children were herded into concentration camps, where 30,000 died of disease. Chains of blockhouses were erected to isolate large sections, which were then combed repeatedly by dragnets of troops. In March 1902 the Boers capitulated, and the treaty of Vereeniging was signed on May 31. The Boers accepted British sovereignty in return for local self-government, and Great Britain guaranteed not to tax the Boers to meet war expenses and paid them damages.

"THE AFRICAN QUEEN"

Humphrey Bogart and Katharine Hepburn in a scene from the United Artists film

Bog (*bŏg*), a morass or quagmire in which the soil is composed largely of decayed or decaying vegetable matter, chiefly sphagnum or peat moss. Bogs are formed in shallow depressions in which water has accumulated and then become overgrown with layers of vegetation. The moss first grows along the water's edge and then across the surface, forming a mat which gradually thickens as humus and soil collect. Bog plants take root in this mat, which may reach great thicknesses and dimensions, as in the Bog of Allen, a series of bogs west of Dublin, Ireland, which cover some 375 sq. m. Other notable bogs (*e.g.*, the Chat Moss near Manchester, England) have been reclaimed. Bogs furnish peat (*q.v.*), and old bogs may be used to grow commercially valuable bog plants (*e.g.*, cranberries). In the U.S. bogs are becoming rare, but a sizable area still exists in the Dismal Swamp of Virginia and North Carolina. See also *Marsh*.

Bogart (*bō'gärt*), HUMPHREY, motion picture actor, born in New York City, Dec. 25, 1899; died in Hollywood, Calif., Jan 14, 1957. After attending Eastern preparatory schools, Bogart joined the U.S. Navy in 1917. He held several jobs before appearing (1923) with Mary Boland and Clifton Webb in "Meet the Wife." He followed this with 13 years of performance in roles of varying importance in New York, in road companies, and, after a number of screen tests, in motion pictures. His first important film role (1936) repeated his earlier portrayal on Broadway of *Duke Mantee* in Robert Sherwood's "The Petrified Forest." A marked success thereafter, particularly in "tough guy" parts, he played in "The Maltese Falcon"; in "Casablanca"—an anti-Fascist melodrama, appearing opposite Ingrid Bergman; in "To Have and Have Not"—opposite Lauren Bacall, whom he later married; and in "The Treasure of Sierra Madre" and "The Caine Mutiny." His starring role opposite Katharine Hepburn in "The African Queen" won him a Motion Picture Acad. Award for 1951.

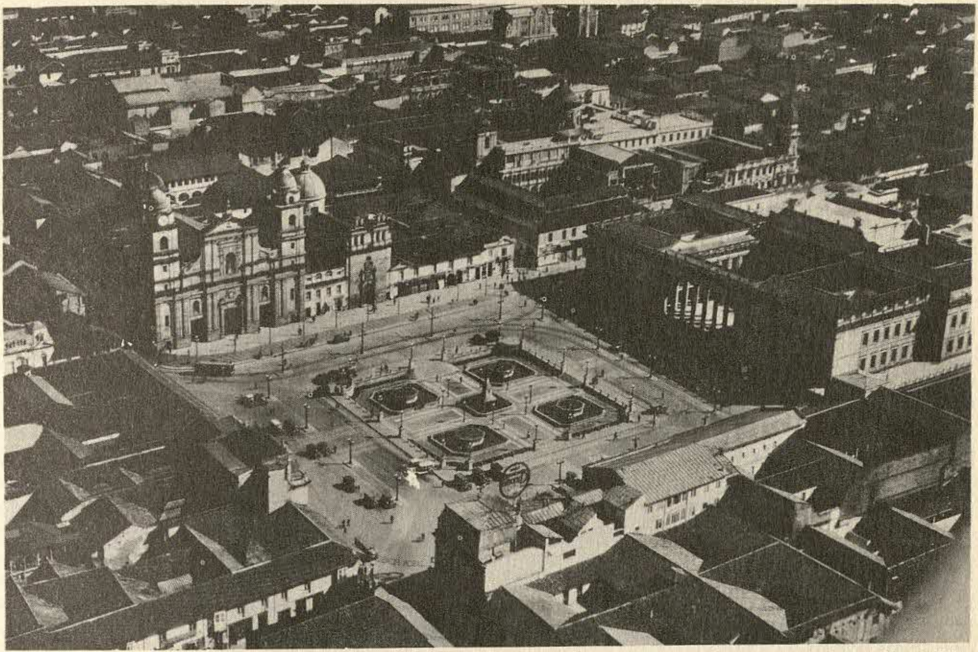
Boggs (*bŏgz*), FRANK MYERS, painter, born in Springfield, Ohio, Dec. 6, 1855; died in Meudon, France, Aug. 11, 1926. Trained in Paris as a student of Jean Léon Gérôme, Boggs was well known in France, and the French government purchased two of his paintings. The artist, who also exhibited in Germany and the U.S., was best known as a marine painter. His "A Rough Day, Honfleur" is in the Boston Museum of Fine Arts, and his "On the Thames" is hung at the Metropolitan Museum of Art in New York City.

Boghead Coal (*bŏg'hĕd*), a form of brown cannel coal, so named from Boghead, Scotland. This coal is especially rich in oils and paraffin hydrocarbons.

Bog Oak (*bŏg ōk*), trunks and roots of fallen trees which are found well preserved many feet below the surface of peat bogs.

Bogomils (*bŏg'ō-mĭlz*), religious heretics of the Middle Ages. They seem to be an offshoot of a group, the Paulicians, which arose in Armenia between the 3rd and 7th centuries and which was settled in the Balkans in the 10th century by the Byzantine Empire. The Bogomils were particularly associated with Bulgaria, and they persisted in Bosnia and Serbia for centuries. They were active missionaries but were persecuted by the Eastern and the Western churches. A link between the heretical groups of the East and the West, they taught a dualistic doctrine, similar to Manichaeism (*q.v.*). The Bogomils denied the divine birth of Christ and the validity of sacraments and church ceremonies. They did not recognize infant baptism (baptism was for adults only); and they refused to form a special priesthood, drawing their priests from among themselves. The movement was also nationalistic and political. The Albigenses and the Waldenses (*qq.v.*) may have been offshoots of the Bogomils.

Bogotá (*bō-gō-tä'*), the capital and largest city of Colombia, located in the west central part of the country, 8,660 ft. above sea level on the edge of Sabana de Bogotá, a great fertile plain. The climate is mild, but there is considerable rainfall. The city was founded in 1538 by the Spaniards and was a center of Spanish power in America until it was liberated by Simon Bolívar in 1819. As the political, financial, and cultural center of Colombia, Bogotá has been called the Athens of America. It is also a leading industrial center, and in the nearby mountains salt, gold, and precious stones are mined. The heart of the city is the Plaza Bolívar, with a statue of the liberator in the center. Other landmarks are the imposing national capitol, many old colonial churches, *e.g.*, that of San Diego, built in 1607, three universities, including the National Univ., founded in 1572 and now located in University City of Bogotá, the Colón Opera House, and several museums. The founding conference of



Courtesy Grace Line

PLAZA DE BOLÍVAR, BOGOTÁ, COLOMBIA

the Organization of American States was held here in 1948 (see *Pan American Union*). Population, 1957 (est.), 1,064,760.

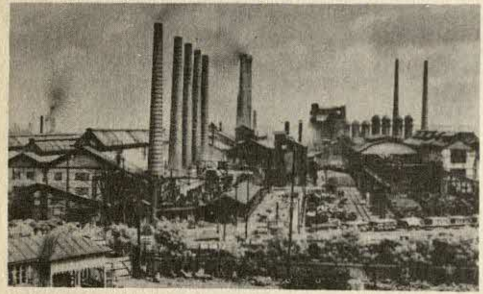
Bohème, LA (*bô-hęm', lä*), opera by Giacomo Puccini (*q.v.*), first performed in Turin, Italy, under Arturo Toscanini's baton, in 1896. The story is based upon Henri Murger's *"Scènes de la Vie de Bohème"* (1848). The opera was first performed in the U.S. in Los Angeles, Calif., in 1897.

Bohemia (*bô-hē'mĭ-ą*), a historical region in Central Europe, formerly a province, now part of a region, of Czechoslovakia. Bohemia, which before World War II was one of four provinces of the Czechoslovakian republic, is a natural geographic area. It is bounded on the N.W. by the Erz Gebirge (Ore Mts.), on the N.E. by the Sudetes Mts., on the S.E. by the Bohemian-Moravian Highlands, and on the S.W. by the Bohemian Forest. In the Riesen Gebirge, a range of the Sudetes, is the region's highest point, the Schneekoppe (5,266 ft.). Lying in the Elbe

LA BOHÈME, ACT II, BY PUCCINI

(Labe) watershed, Bohemia is traversed by the Vltava (Moldau) and Ohře (Eger) rivers.

The area of the province in 1946 was 19,573 sq. m., and the population totaled some 5,500,000, with *ca.* 1,000,000 in Prague, the capital of the province and of the country. Since the abolition of the province in 1948, no figures on area or population have been released.



BOHEMIAN STEEL MILLS

Bohemia possesses vast deposits of coal and produces large quantities of iron and steel

Among Bohemia's cities are Prague (or Praha), Plzeň (Pilsen), Hradec Králové (Königgrätz), Karlovy Vary (Karlsbad), České Budějovice (Budweis), and Ústí nad Labem (Aussig).

Economy: Bohemia, the most heavily industrialized territory in Czechoslovakia, was noted early for its mineral wealth, including its medieval silver mines. Coal and uranium (found at Jáchymov, or Joachimsthal) have replaced the silver as major minerals, and iron and kaolin deposits are also important. Electric power is highly developed.

The industries include glass-making, important since the Middle Ages; chemicals; textiles; iron-smelting and steelmaking; brewing, particularly of the beer known as Pilsner or Pilsen beer; and the manufacture of porcelain and heavy machinery. The forests of Bohemia have long furnished materials for an important timber industry, including the manufacture of paper.

Before World War II, about one-third of the land was devoted to agriculture. The major crops are cereals, sugar beets, and hops (used in brewing). Refined sugar is an important agricultural product.

The mountain scenery and the mineral springs of Bohemia have made it a health and recreation resort for centuries. Particularly notable are the spas of Karlovy Vary (Karlsbad), Teplice-Šanov (Teplitz), and Márianské Lázně (Marienbad).

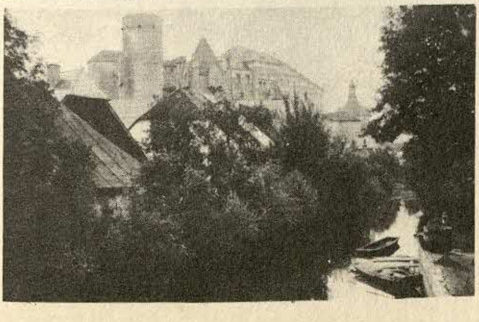
Culture: Bohemia, traditionally Protestant and Czech-speaking, became largely Catholic in the years of Hapsburg domination. The Germanization of the country forced out the Bohemian aristocracy, and German replaced the Czech language. In recent history, however, Czech has again become the principal language of the region.

Living on the western boundary of the Slavs with the Germans, the Slavic Bohemians developed a characteristic distrust of German culture, and their literature reflected their intense nationalism. Czech literature (that is, literature in the Czech language) dates from the second half of the 13th century. The poetry and concern with social questions which marked the 14th century were joined by the polemical and didactic literature of John Huss and the Hussites (*qq.v.*) in the 15th and 16th centuries. The writings of the Bohemian Brethren (*q.v.*) and of the religious mystic Peter Chelčicky (1390-1460) preserved the Czech language, and the 16th-century Bible version of the Brethren (the Kralice Bible) was a major literary force. But the increasing power of the German ruling class and the devastation of the Thirty Years' War reduced Czech to a peasants' language. The educator Jan Amos Komenský (Johann Comenius, *q.v.*) wrote from exile. The mounting pressure of the Bohemian nationalist movement resulted in some recognition of the Czech language, encouraged by the philologists of the late 18th century, notably Josef Dobrovský (1753-1829). The historian František Palacký (1798-1876) was an eminent forerunner of modern Czech literature, and his "History of Bohemia" exerted considerable influence on Thomas Masaryk (*q.v.*). The early 19th-century Romantic era produced much heroic poetry, followed by the historical themes of such novelists as Alois Jirásek (1851-1930) and the realism of the journalist Karel M. Čapek-Chod (1860-1927). This later writing emphasized social conditions and the claims of a subject people.

History: Of the early history of Bohemia, little is known, except in legend, beyond the name—the *Boii*—of the inhabitants. The origin of the ruling Přemyslid dynasty is also obscure. The Czechs, a Slavic group, were established in the area by the 6th century, and the barbaric invasions of Europe had already introduced the conflict between Slav and German which determined the region's subsequent history. Slavonic missionaries introduced Christianity about A.D. 900. By A.D. 950, the suzerainty of the Holy Roman Empire over the Přemyslid dukes had been recognized. To this early period belongs the 10th-century ruler, St. Wenceslas (*q.v.*). For a short time during the 13th century, Bohemia extended from the Elbe to the Adriatic, under Ottokar II (1230?-1278) of Austria. The Přemyslid line came to an end in 1306, and John of Luxemburg (1296-1346) was elected king in 1310. He made Bohemia an international power, but his ventures kept him away from the country, and his son Charles (Emperor Charles IV, *q.v.*) had to restore order. Under Charles, Bohemia was united with Moravia, Silesia, and Upper Lusatia; the Univ. of Prague was founded (1348); and the Bohemian ruler was made one of the first-ranking electors of the empire. At the death (1419) of Charles' son, Wenceslaus (*q.v.*), however, the imperial connection began to weaken. The Bohemians asserted their independence, and the martyrdom of John Huss by Sigismund (*qq.v.*) gave shape to the political quarrels. John Ziska led the Hussites (*qq.v.*) in their defense against the papal Bohemian crusade (1420-22), but his death and the later civil war defeated (1434) the radical Hussites (Taborites). Only one ruler of native blood held power in the 15th century—George of Poděbrad (1420-71), a leader of the moderate Hussites (Utraquists), who became administrator of Bohemia in 1452 and king in 1459. He attempted to reconcile the Hussites and Catholics but persecuted the Bohemian Brethren (*q.v.*). The Hungarian and Bohemian crowns were united late in the 15th century, and Bohemia's local government declined in importance (see also *Austria:* HISTORY; *Matthias Corvinus*). The peasants were reduced to virtual serfdom. In 1526 Ferdinand I (*q.v.*) was elected king, and the next century witnessed the effect of the efforts of the Hapsburg (*q.v.*) line to extend their hereditary holdings (see also *Reformation*). An uprising, which culminated in the Defenestration of Prague (1618) and the short reign (1619-20) of Frederick the Winter King, left Bohemia devastated and at the mercy of the German Catholic nobility (see *Thirty Years' War*). During the 18th century, under Joseph II, the country lost all remaining semblance of autonomy. Following a brief period of increasing freedom and prosperity, the revolution of 1848 brought new severity from Vienna, and not until the end of the 19th century did renewed hope of independence arise. Finally, after World War I, Czechoslovakia was formed, uniting Bohemia, Slovakia, Moravia, and part of Silesia (*qq.v.*). A German minority remained in the Sudetenland (*q.v.*), however, and furnished the excuse for the dismemberment of Czechoslovakia after the Munich Pact (*q.v.*); in 1939-45 the rest of Bohemia was included with Moravia in the German "Protectorate of Bohemia and Moravia." After World War II, Bohemia regained its status as a province of Czechoslovakia, and the remaining Germans were resettled in Germany. Since 1948, however, Bohemia has been merged with Moravia and Silesia in the Czechoslovakian region known as the Czech Lands.

CASTLE IN SOUTHERN BOHEMIA

Built in the 13th century, this castle played a role during the Hussite Wars



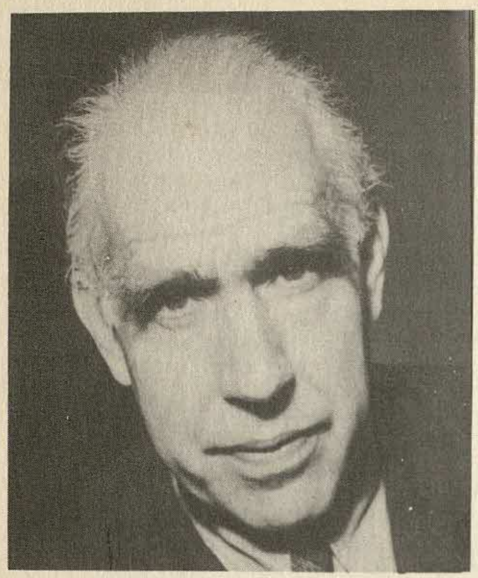
Bohemian Brethren (*bô-hē'mĭ-ạn brĕTH'-r'n*) or COMMUNION OF THE BRETHREN, a religious body of the 15th through 17th centuries, related to the Taborites or radical Hussites (*q.v.*). They continued the fight of the Taborites for church reform and religious freedom, even as the moderate Hussites (Utraquists or Calixtines) began to turn back to the Roman Catholic Church. The Brethren allied themselves with the Lutherans in the 16th-century religious wars (see *Protestants; Reformation*). For a short time, they enjoyed partial religious liberty, with the abrogation of the Compactata—which had recognized the rights of only the Utraquists—and the granting of the *Majestätsbrief* (1609). But persecution of the Brethren was renewed, and the Thirty Years' War (*q.v.*) drove them from Bohemia. Jan Amos Komenský (see *Comenius, Johann*) was their last bishop. The Bohemian Brethren were forerunners of the Moravian Brethren (*q.v.*) of the 18th century.

See also *Bohemia:* CULTURE.

Bohemian Forest (*bô-hē'mĭ-ạn fŏr'ĕst*), a chain of mountains in Central Europe, known as the *Böhmer Wald* in German and as the *Český Les* in Czech. The range lies between Bohemia and Bavaria, extending from the Danube to the Fichtel Gebirge. It separates the basins of the Elbe and the Danube and culminates in Mt. Arber, in Bavaria, which reaches 4,780 ft. above sea level.

Bohol (*bô-hôl'*), an island of the Philippines, located north of Mindanao and southwest of Leyte, one of the Visayan Islands. The island has an area of 1,492 sq. m. and forms the major part of Bohol province (1,575 sq. m.). The provincial capital is at Tagbilaran. While the surface is mountainous and forested, considerable agriculture is carried on; the chief products are rice, sugar, tobacco, and hemp. Weaving is the major industry. Population of the province, 1948, 553,407.

Bohr (*bôr*), NIELS HENRIK DAVID, physicist, born in Copenhagen, Denmark, Oct. 7, 1885; died there, Aug. 18, 1962. He received M.S. and Ph.D. degrees from the Univ. of Copenhagen and did postgraduate work in mathematical physics in Manchester, England. He was appointed director (1916) of the Univ. of Copenhagen Inst. of



Courtesy Danish Information Office, N. Y.
NIELS BOHR

Theoretical Physics (1920). His researches concerned the structure of the atom, to which he applied Planck's quantum theory, evolving the Bohr theory of atomic structure. In this theory, the atom is considered to have a nucleus around which a series of electrons revolve in orbits. Radiation is given off when an electron passes from an orbit of higher energy to one of lower energy; see Bohr's "Theory of Spectra and Atomic Constitution" (1922). He is the author of many scientific papers on the theory of atomic structure, and his researches on the electric charge of the atom were rewarded with the Nobel Prize for Physics in 1922. Since then he has received many other scientific honors. Bohr, who remained in Denmark after the German occupation during World War II, was threatened with arrest in 1943. Rescued and brought to the U.S., he worked on the first atomic bomb (*q.v.*) and was cited for his contributions to that project by the U.S. and Great Britain in 1945. He returned to Copenhagen and resumed his position at the head of the Inst. of Theoretical Physics after the war. Instrumental in setting up the 1955 Atoms for Peace conference, Bohr was given the first $75,000 Atoms for Peace Award in 1957.

Boieldieu (*bwäl-dyû'*), FRANÇOIS ADRIEN, composer, born in Rouen, France, Dec. 16, 1775; died in Paris, Oct. 8, 1834. He was trained as an organist and pianist in Rouen and had written a few operas before going to Paris in 1795. There, Boieldieu was a professor of piano (1798-1803) and of composition (1817 *et seq.*) at the Conservatory and a successful composer of comic operas. He studied with Luigi Cherubini (*q.v.*) and collaborated at various times with him and with Rodolphe Kreutzer (*q.v.*). In 1803-11 he served as conductor of the Imperial Opera at St. Petersburg (Leningrad). The most notable of Boieldieu's operas are *"Le Calife de Bagdad"* (1800), *"Jean de Paris"* (1812), *"Le Petit chaperon rouge"* (1818), and, particularly, *"La Dame Blanche"* (1825).

Boil (*boil*) or FURUNCLE, a painful infection of the skin (*q.v.*) caused by the entrance of bacteria into a hair follicle or a sebaceous gland. The most frequent causative germ is staphylococcus. Usually a boil begins as a small, red, tender swelling of the skin; the center of the boil becomes yellowish because of the production of pus (*q.v.*). Diabetes (*q.v.*) is often accompanied by crops of boils; since they are a complication of the disease, an examination of the urine should be done in all patients who have frequent attacks of boils. In the early stages, hot applications may relieve pain and hasten the boil's softening. Squeezing or inexpert handling, however, may spread the infection, with serious results. Lancing by a physician may be indicated, and specific antibiotics—administered both locally and internally—are of value.

Boileau-Despréaux (*bwä-lō'dā-prâ-ō*), NICOLAS, poet and critic, born near Paris, France, Nov. 1, 1636; died there, March 13, 1711. Educated in theology and the law, Boileau was able to concentrate upon writing after 1657, when he inherited a small income. He took the name Despréaux from a property he owned. Boileau was associated with the court of Louis XIV and with the literary group around Racine, Molière, and La Fontaine (*qq.v.*). His work as a poet was based closely on Roman models, particularly on Horace and Juvenal. The early works were satires on manners, some of which circulated in manuscript before he authorized an edition of them in 1666. He earned many enemies with them, but he was, nevertheless, made historiographer—with Racine—for Louis XIV, receiving a pension in 1677. His work *"L'Art poétique"* (1674) played a role in winning him royal favor. This was a treatment of the "rules" of poetic composition, setting forth a pattern for the various forms used by poets of his time and outlining the principles of neoclassicism as practiced by Racine, Molière, and others. It assumed the force of law in literary criticism in the 18th century, but it has since lost much of its reputation. Boileau was admitted to the French Acad. in 1684, against considerable opposition. Notable among his other works were his epistles and his *"Réflexions critiques sur Longin"* (1693). In the last-named, he upheld the "ancients" (*i.e.,* Greek and Roman literary figures) against the "moderns" (as he called his contemporaries and immediate predecessors) in an extended literary controversy.

Boiler (*boil'ẽr*), an open vessel for boiling liquids, usually constructed of iron, steel or aluminum and named from its particular use. This classification would include household boilers used for cooking, canning and laundry purposes.

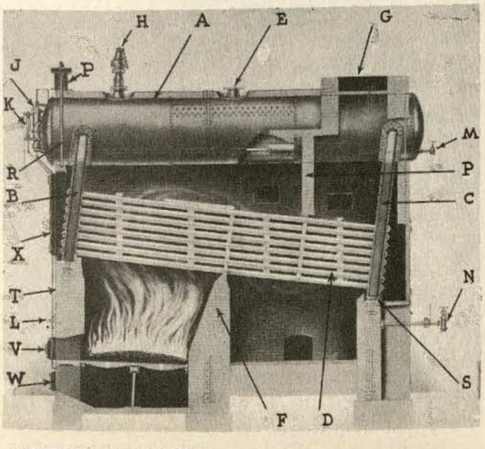
Another type is the closed vessel, of iron or steel, through which the heat, from the products of combustion, is transmitted to the water within, converting the water to steam and creating a pressure inside the vessel greater than atmospheric pressure. This classification would include boilers for heating purposes, portable and stationary power plants, marine and locomotives.

Boilers are generally classified according to the form of construction such as *flue, fire tube* and *water tube*. Flue boilers are cylindrical in shape, can be set in a horizontal or vertical position, are internally and externally fired, the products of combustion passing through single, double or triple flues surrounded by water. Flue boilers are of the older types and have practically gone out of use.

Fire tube boilers are mostly cylindrical in shape, can be set in a horizontal or vertical position, are internally and externally fired. The products of combustion pass through a series of tubes surrounded by water, thus obtaining a greater heating surface, for a given boiler size, than can be obtained with the flue boilers. Those used for stationary steam generators are usually enclosed in brick work, in order to prevent a loss of heat by radiation.

Water tube boilers can be set in a vertical or horizontal position, the water passing through a series of tubes which are surrounded by the products of combustion. Water tube boilers have quick steaming properties and great capacity for overload; they have been generally adopted wherever the demand for steam is sudden and intermittent.

The boiler shown in the illustration is a water tube boiler. The boiler consists of a steam and water drum "A" to which are securely riveted a front "B" and rear "C" water leg or header. The tubes "D" are expanded into these headers in straight, horizontal and staggered vertical rows which are inclined from front to back.



WATER TUBE BOILER

The drum "A" is horizontal, providing a maximum steam disengaging surface. The steam outlet "E" is placed in the center of the drum.

Vertical baffle walls "F" of interlocking absolutely gas-tight fire brick direct the flow of gases. The bases pass up from the fire among the tubes and under the second baffle, escaping to the uptake "G" after a third travel through the bank of tubes. The staggered arrangement of tubes breaks up and thoroughly mixes the gases and the triple pass admits of the maximum transfer of heat.

The drums and headers are made of open hearth homogeneous flange steel, the tubes are lap-welded steel, the rivets are iron or soft steel, the staybolts of double-refined iron, the nozzles are made of steel. The construction is made to conform to the American Society of Mechanical Engineers' Boiler Code, which insures maximum safety.

The accessories consist of a pop safety valve "H" located on the top of the drum, a heavy cast iron water column "J," with gauge cocks and water glass "K," feed valve "L," check valve "M," blowoff valve "N" together with a steam gauge located on the front of the boiler mounting.

The boiler is hung in front from a channel iron girder "P" by means of a U-bolt hanger "R." The rear header rests in expansion plates and in rollers "S" on plates built into the wall, so that the boiler is free to expand and contract without cracking the brick walls.

The sectional steel plate fronts "T" are provided with cast iron doors "V" and ash pit doors "W" hung on cast frames. Sheet iron flue doors "X" in cast iron frames at the front are large enough to give access to the whole tank of tubes.

Boiling (*boil'ing*), an important operation in the preparation of food. It has the effect of softening nutritive articles, causing a solution of sugar and starch grains, and making them more easily digested. In boiling meats they should be suddenly plunged into boiling water so as to cause a coating or protective layer of coagulated albumen to form on the surface. This serves to retain the more nutritious portions within. After a few minutes the temperature may be considerably lowered. For soups and broths the meats should be heated gradually so as to allow the more nutritious elements to escape from the meat into the soup. Boiled food is more digestible than stewed, roasted, or fried food.

Boiling Point, the degree or point at which any liquid boils. This depends upon the constituents of the liquid and the conditions of the atmospheric pressure. The boiling point is always the same, if the physical conditions are the same. It is highest at the level of the sea, and is lowered 1° F. with every 597 ft. of ascent; this is due to a decrease of atmospheric pressure as we ascend. After liquids begin to boil, their temperature is not raised. The following is the boiling point of the liquids named below, according to Fahrenheit's thermometer:

Mercury	662°	Water	212°
Sulphuric acid	610°	Nitric acid	210°
Olive oil	600°	Alcohol	173°
Phosphorus	554°	Bromine	145°
Iodine	347°	Sulphuric ether	113°
Naphtha	320°	Muriatic ether	52°
Oil of turpentine	314°	Ammonia	28°

Boise (*boi'sĭ*), capital and largest city of Idaho, seat of Ada County, in the southwest, on the Boise River, *ca.* 290 m. N.W. of Spokane, Wash. It is served by the Union Pacific R.R.; Boise Municipal Airport is 5 m. S.E. of the city. The marketing center for a mining, dairying, and farming region, Boise processes food products and manufactures furniture, electrical equipment, foundry and wood products, rugs, and mattresses. In 1958 it had a value added by manufacture of $11,539,000. It is the seat of the Roman Catholic Cathedral of St. John the Evangelist and the Protestant Episcopal St. Michael's Cathedral. Founded (1863) after the discovery of gold in the area, Boise was incorporated and became capital of Idaho Territory in 1864. Population, 1950, 34,393; 1960, 34,481.

Boito (*bō'ē-tō*), ARRIGO, composer and librettist, born in Padua, Italy, Feb. 24, 1842; died in Milan, June 10, 1918. His first opera, "Mefistofele," showing the influence of Liszt and Wagner, was unsuccessfully produced (1868) at La Scala in Milan; in a revised version it was played and acclaimed (1875) at Bologna. Boito's greatest success was as a librettist; he wrote the books for many operas, including Verdi's "Otello" and "Falstaff" and Ponchielli's *"La Gioconda."* He was also author of a volume of poetry, written under the pen name Tobia Gorrio.

Bojador (*bŏj'ạ-dôr*), CAPE, a promontory of western Africa, on the coast of Rio de Oro, south of the Canary Islands, at N. lat. 26° 15'. It is a hazard to navigation.

Bok (*bŏḳ*), EDWARD WILLIAM, editor and author, born in Den Helder, Netherlands, Oct. 9, 1863; died in Lake Wales, Fla., Jan. 9, 1930. He was brought to the U.S. *ca.* 1870. Bok started his career as a stenographer in New York City publishing houses. As editor in chief (1889-1919) of the *Ladies' Home Journal,* he introduced a number of features since generally adopted by women's magazines. In 1923 he gave a prize of $100,000 for the best plan to establish world peace. He was the author of "Why I Believe in Poverty" (1915), "The Americanization of Edward Bok" (1920; Pulitzer Prize, 1920), "Dollars Only" (1926), and "Perhaps I Am" (1928).

Boker (*bō'ḳẽr*), GEORGE HENRY, dramatist, poet, and diplomat, born in Philadelphia, Pa., Oct. 6, 1823; died there June 2, 1890. A graduate (1842) of the Coll. of New Jersey (now Princeton Univ.), he abandoned the study of law after a trip to Europe and devoted himself to a literary career. His first play, "Calaynos," was produced in London (1849) and Philadelphia (1851). "The Betrothal" was performed (1850) in Philadelphia. Boker's best plays were "Leonor de Guzman" (1853) and "Francesca da Rimini" (1855). He also wrote several volumes of poetry. He served as U.S. minister to Turkey (1871-75) and to Russia (1875-79).

Bokhara (*bō-ḳä'rä*). See *Buḳhara.*

Bolan (*bô-län'*) **Pass,** a defile in the mountains of West Pakistan, in the former province of Baluchistan. The pass is *ca.* 60 m. long and, at its crest, 5,900 ft. high. It is crossed by a railroad which connects the former province of Sind with Afghanistan.

Bolero (*bô-lâr'ō*), an intricate Spanish dance for a single individual or a couple, said to have been invented *ca.* 1780. The music is in 2/4 or 3/4 time, and the dance is performed to the accompaniment of castanets, guitars, and the voices of the dancers. Of the many compositions written in this form, Chopin's bolero for piano and Maurice Ravel's "Bolero" for orchestra (1928) are especially noted.

Boleslaus (*bō'lẹ-slôs*) or BOLESLAV, any of three kings of Poland, who reigned in the 10th, 11th, and 12th centuries. *Boleslaus I* (966?-1025) was duke and (from 1000) king of Poland; he enlarged the Polish domain and freed the Polish church from German domination. He successfully fought the Holy Roman emperors Otto III and Henry II, and at his death Poland was one of the strongest states of Europe.

His grandson, *Boleslaus II* (1039?-1083), became king in 1058. He conquered the Russian principality of Kiev. After a controversy with the Papacy, he was excommunicated by Pope Gregory VII and exiled to Hungary, where he died.

Boleslaus III (1086-1138) was king from 1102. He reunited the kingdom, which had been divided between him and a bastard half-brother, and annexed Pomerania from the Holy Roman Empire.

Boleyn, ANNE. See *Anne Boleyn.*

Bolingbroke (*bŏl'ĭng-brŏŏḳ*), HENRY ST. JOHN, VISCOUNT, statesman, born in Battersea, England, Oct. 1, 1678; died there, Dec. 12, 1751. He entered Parliament in 1701 and became known as a strong Tory supporter. Winning favor with the Duke of Marlborough and Queen Anne, in 1704 he entered the ministry as secretary

In 1710 he became a privy councillor and secretary of state in the new ministry, sharing the leadership of the Tory party with Robert Harley (*q.v.*). He was created a viscount (1712) and helped to negotiate the Treaty of Utrecht (1713). From the moment he took office, Bolingbroke was identified with the Stuart interests. In 1714 he contrived the dismissal of Harley, hoping to assume sole leadership of the Tories. However, the death of Queen Anne and accession of George I, and the subsequent change of ministry, forced him to flee to Paris, where he entered into negotiations with James Stuart, the "Old Pretender," serving as his secretary (1715-16). Disillusioned with the Stuart cause because of its insistence on Roman Catholicism, Bolingbroke was finally pardoned (1723) and allowed to return to England. However, he was excluded from the House of Lords by Robert Walpole (*q.v.*) and settled on a country estate where he renewed his friendship with Swift and Pope (*qq.v.*). He wrote the basic philosophy (*ca.* 1730) of Pope's "Essay on Man." Unsuccessful in a series of intrigues to unseat Walpole, Bolingbroke retired to France (1735), where he wrote "The True Use of Retirement" (1736) and "Letters on the Study of History" (posthumously published, 1752).

Bolitho (*bō-lī'THō*), WILLIAM (full name, WILLIAM BOLITHO RYALL), journalist and author, born in Cape Town, South Africa, in 1890; died in Avignon, France, June 2, 1930. He studied at the Univ. of Cape Town, worked his way to London, and served in World War I in the British army. After the war, he became Paris correspondent for the Manchester *Guardian* and European correspondent for the New York *World.* His books include the political commentaries "Leviathan" (1924) and "Italy under Mussolini" (1926) and the collective biographical studies "Murder for Profit" (1926) and "Twelve Against the Gods" (1929). A play, "Overture—1920," was produced posthumously in New York City (1930).

Bolívar (*bô-lē'vär*), SIMÓN, soldier, statesman, born in Caracas, Venezuela, July 24, 1783; died near Santa Marta, Colombia, Dec. 17, 1830. After studying law at Madrid, he traveled extensively in Europe, witnessing the closing scenes of the French Revolution and absorbing the politics of republicanism. In 1806, he returned to Venezuela and became absorbed in that country's revolutionary movement. As one of the leaders of the army of liberation, he met with defeat at the hands of Spanish forces and fled to Colombia, where he raised another military force for a march on Venezuela. After a repeated defeat, he was finally able to enter Caracas in triumph and there was proclaimed "Liberator of Venezuela" on Aug. 6, 1813. In 1814 the royalists again captured Caracas, causing him to flee to Jamaica. He next gathered insurgents in Haiti and proceeded to Venezuela with his guerrilla fighters, in 1817, to begin a lengthy campaign against the Spanish. Fighting in the desolate back country and in high Andean passes, he was able to split the Spanish forces. Finally, he achieved a decisive victory at Boyaca, Aug. 7, 1819, and the new republic of Colombia (including what is now Colombia, Venezuela, and Ecuador) was proclaimed, with Bolívar as its president.

SIMÓN BOLÍVAR

Thereafter, Bolívar proceeded south into Peru, where he ended the struggle against the last of the Spanish viceroys in 1824. In 1825 he routed the Spanish from Upper Peru, which was subsequently named Bolivia in his honor.

Imaginative and daring as a military leader and political organizer, Bolívar was the single most powerful figure in South America. Creator of Colombia, Peru, and Bolivia, he dreamed of uniting all the Spanish American republics. To this end he called a conference of the new republics at Panama in 1826. Although little came out of the meeting, it was the beginnnig of Pan-Americanism. Soon after, separatist movements arose in Colombia, in opposition to Bolívar's tremendous powers and his arbitrary methods.

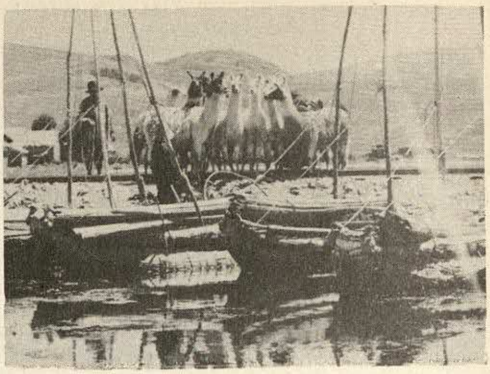
In 1827 he suppressed a revolt in Caracas and proclaimed himself dictator the following year in order to salvage his rapidly waning political power. Colombia, Venezuela, and Ecuador finally separated and founded independent republics; and Bolívar, impoverished, ill, and bitter, resigned the presidency in 1830. A headstrong idealist, he was alternately the object of passionate admiration and deep hatred. Today, he is recognized as the foremost Latin-American patriot.

Bolivia (*bô-lĭv′ĭ-à*), a republic of South America, in the western part of the continent. It is bounded on the N. and E. by Brazil, on the S. by Paraguay and Argentina, and on the W. by Chile and Peru. The total area is 416,040 sq. m.

DESCRIPTION. While three-fifths of Bolivia consists of lowlands, the remainder, in the western part, is one of the highest inhabited areas in the world. There, the Andes reach their greatest breadth and height. The mountain range is divided into two parallel chains, enclosing a plateau where most of Bolivia's population lives. Rising from the plateau are several mountain peaks, such as Illimani, Illampu, and Sajama, which are well over 21,000 ft. The general surface slopes toward the east and north, forming a large part of the central plain of South America. On the western boundary is the famous Lake Titicaca, with an area of about 3,250 sq. m., and a depth of 120 fathoms. In the north is Lake Rogoaguado, and in the central west is Lake Poopó. Most of the rivers rise in the western and central parts and belong to the Amazon and La Plata river systems. Among the chief rivers are the Guaporé, the Mamoré, the Beni, and its tributary, the Madre de Dios, which discharge through the Madeira into the Amazon. The Chaco, with its tributaries, the Bermejo and the Pilcomayo, is an important river in the southern part of the country.

As in other Andean countries, the climate of Bolivia is determined by elevation rather than by latitude, the temperature varying with the altitude. In the tropical *yungas,* comprising all lowlands and mountain valleys up to 5,000 ft., the climate is hot, rainy and humid, with a mean temperature of 77° F. The *valle* zone, including areas ranging from 5,000 to 9,500 ft., is semitropical in climate, having an even, warm temperature with little annual variation. Above the *valle* zone is the *cabecera de valle,* with elevations from 9,500 to 11,000 ft. There, the climate is temperate and subject to an occasional winter frost. Crowning these three climatic belts, which merge with Bolivia's inhabited areas, are cold, bleak zones progressing into arctic temperatures

AGRICULTURE. Much of the farmland is owned by large investors and by the Indians. Farming is primitive, especially in the matter of cultivating the soil. It yields little more than is needed to supply the local demand, although the country is capable of large production. Many fruits are cultivated, especially bananas, pineapples, peaches, lemons, figs, and grapes. All the cereals, such as wheat, corn, and barley, are grown, and considerable quantities of alfalfa, coffee, sugar cane, and vegetables as well. The Indians raise horses and sheep. Mules, swine, alpacas, llamas, and vicuñas are also reared.



Pictures courtesy Grace Line

BOLIVIA. LAKE TITICACA

TIN MINES AT VELACO, BOLIVIA

NATURAL RESOURCES. Extremely valuable forests, containing numerous varieties of trees, cover a vast extent of the tropical lowlands. There thrive mahogany, ebony, cork, cedar, rosewood, and many species of palm. The Bolivian highlands are treeless, but covered with nutritious grasses. Most noteworthy of the country's natural resources are the mineral deposits, which rank Bolivia as the world's third largest producer of tin.

In the unpopulated regions may be found many wild animals, such as the puma, jaguar, tapir, and armadillo, in addition to such birds as the toucan, parrot, and pigeon. Alligators, lizards, and several varieties of snakes inhabit the Amazon region. Some of the most important Bolivian animals, however, are the llama, the alpaca, and the vicuña of the highlands.

INDUSTRIES. Mining continues to be the leading industry of Bolivia. Fifteen per cent of the world's tin is produced here. Copper, lead, zinc, antimony, tungsten, bismuth, wolfram, gold and borate of lime are also found. Silver was once the basis of the mining industry, but was superseded by tin after 1900. Minerals account for *ca.* 95 per cent of the country's exports.

Although Bolivia is rich in oil, exploitation of the deposits was delayed by a war with Paraguay, during the 1930's, for the control of the Santa Cruz oil fields near the Paraguay border. Since the middle 1940's, however, Argentina and Brazil have contributed handsomely to the development of Bolivian oil wells.

Bolivia's manufacturing industries are in their infancy. Like agriculture, they play only a small part in the total economy and are confined to domestic consumption. Textiles, building materials, food products, and chemicals rank high in Bolivian manufacturing.

Exports, consisting of rubber, tin, and other metals, have been steadily increasing. Efforts are being made to diversify production and eliminate the excessive reliance on one product (principally tin). The U.S. absorbs about two-thirds of Bolivia's exports. Imports, also on the increase, consist mainly of manufactured goods and food products.

TRANSPORTATION. Since Bolivia has no seacoast, overseas trade is carried through the Peruvian port of Mollendo and the Chilean harbor at Antofagasta. Railroads connect these two seaports with coastless Bolivia. Inland water transportation, however, is important, especially in the Amazon basin, along the principal rivers, and on Lake Titicaca. Bolivia's railroads totaled 1,712 m. in 1948; highways totaled 43,362 m., of which 15,386 m. were unpaved. About 700 m. of the Pan American Highway run through the country. Four airlines provide excellent passenger and freight services, which increased at a phenomenal rate during the 1940's.

EDUCATION. Education is free and compulsory, beginning when children are 7 years old and lasting for 7 years. Instead of pursuing the regular secondary course of studies after completing elementary training, students may enroll in vocational, industrial, or normal schools, as well as in schools of arts and crafts. Four years of secondary education may lead either to advanced vocational or technical training or to preparation for entrance into a university. Among Bolivia's eight universities, the oldest is the Univ. of San Francisco Xavier, founded in 1624 at Sucre.

POPULATION. The racial composition of Bolivia's population is made up of three principal groups: 52.34 per cent Indian, mainly Quechuas and Aymarás; 13.08 per cent white, largely of Spanish origin; and 27.5 per cent mestizo, or mixed Indian and white. For the most part, the whites are the large landowners, the business leaders, and professionals, the mestizos are the salaried employees and small businessmen, and the Indians provide labor for the mines and fields, while maintaining their tribal societies. Immigration into Bolivia has been slight, with the recent exception of a fairly large immigration from Germany. Most Bolivians are Roman Catholics, although there are numerous Protestant churches.

The population is confined to the plateau area in western Bolivia. La Paz, containing 302,000 people, is Bolivia's largest city and the highest city in the world. The capital is at Sucre; other leading cities are Cochabamba, Potosí, Oruro, Santa Cruz, Tarija, and Trinidad. Population, 1951 (est.), 3,054,000.

GOVERNMENT. Bolivia is a republic organized as a representative democracy. Executive power is vested in the president (who is elected for a six-year term), a vice president, and the ministers of state. The legislative authority rests in a Congress of two houses—a 27-member senate, elected for six years, and a 110-member chamber of deputies, elected for four years. The judiciary comprises the supreme court and district, superior, and special tribunals. Local government is administered by the eight departments, which are divided into provinces and cantons.

HISTORY. The history of Bolivia is characterized by many wars and insurrections. It was a part of the ancient empire of the Incas, conquered for Spain by Hernando Pizarro in 1538. At that time it was made a part of Peru and later of the government of La Plata. In 1825 the country was organized as a separate state and named in honor of Simón Bolívar (*q.v.*), who became its first president under a constitution drawn by him and adopted in 1826. In 1836 it was annexed to Peru under President Santa Cruz, but the union was soon set aside, and Bolivia has since been the scene of many revolutions and civil wars. Chile declared war against Bolivia and Peru, 1879-81, and as a result the port of Arica and adjacent territory were lost to the Bolivians, thus cutting them entirely off the Pacific coast. A revolution took place in 1898 over the creation of Sucre as capital city. In 1903, part of Acre Province was ceded to Brazil. During World War I, Bolivia sided with the allies, signed the 1919 Peace Treaty, and became a member of the League of Nations. Unsuccessful attempts to arbitrate her boundary with Paraguay resulted in the Gran Chaco War of 1932-35, in which Paraguayan arms generally triumphed. As a result of this conflict, Bolivia in 1938 ceded about 100,000 sq. m. of the Gran Chaco, a jungle region on her southeastern border, to her neighboring republic. In World War II, Bolivia sided with the United Nations (1943).

Postwar Bolivia suffered revolutions of the right and left; yet, despite these difficulties, the country entered a new period of development. Attempts were made to expand agriculture, to alleviate the lot of the Indians, and to diversify industry.

Bollandists (*bŏl″n-dĭsts*), an association of Belgian Jesuit scholars engaged in editing an authoritative compilation of the lives of the Roman Catholic saints and martyrs. This work, the "*Acta Sanctorum*," was begun in the first years of the 17th century and is still under way, currently comprising more than 60 folio volumes. The collaborators take their name from Johann van Bolland (1596-1665), the editor of the first volume.

Boll Weevil (*bōl wē′vĭl*), a grayish beetle (*Anthonomus grandis*), about ¼ in. long, which bores into the buds or growing bolls of the cotton plant and lays its eggs there. Native to Mexico or Central America, the boll weevil was first observed in the U.S. in 1892. Within 30 years it had infested more than 85 per cent of the Cotton Belt, causing damage of up to $200,000,000 a year. The weevil is controlled by destroying infected plants in the fall and by dusting cotton fields with insecticides. See also *Weevil.*

Bologna (*bô-lō′nyȧ*), a city in northern Italy; capital of the province of Bologna, *ca.* 60 m. N. of Florence. One of the oldest cities of Italy, it was founded *ca.* 700 B.C. by the Umbrians, who called it Felsina. About 400 B.C. it was conquered by the Celts, who renamed it Bononia, and in 189 B.C. it became the center of a Roman colony. Thereafter it shared the fate of the Western Empire, being conquered by the Goths and later by the Lombards. In 1116 the German Emperor, Henry V, made Bologna an independent free city. Through the 14th and 15th centuries the Popes and rulers of other Italian states fought to possess it. Eventually (1506) it fell into the possession of the Church, remaining so until the conquest of the city by Napoleon Bonaparte in 1796. In 1860 it became a part of the united Italian kingdom.

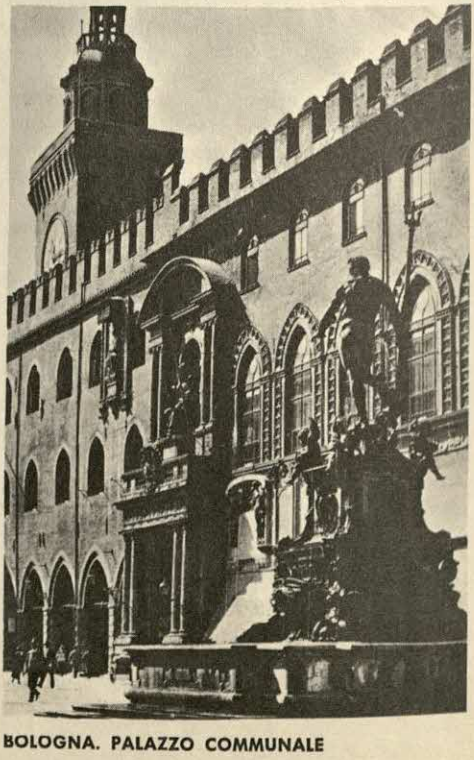
Bologna early became an intellectual center. The first European university was founded there in the 12th century. Among its teachers were great mathematicians and physicians like Luigi Galvani (*q.v.*) and Vesalius (*q.v.*). Scholars executed the first anatomical dissections there, thus adding to the school's fame and attracting students from all corners of Europe. The library of the university owns *ca.* 215,000 printed books; among its rare manuscripts is a Dante codex of the 14th century.

Architecturally, Bologna is specially noteworthy for the arcades which cover many of its sidewalks. The Church of San Petronio, begun in 1390 and finished during the Renaissance, is one of the largest in the world. Numerous towers (*e.g.*, Degli Asinelli and Garisanda, both built in the 12th century), growing out of the palaces of the old noble families, are still preserved and give the city a medieval air, as does the still-remaining part of the medieval city wall. Many Italian artists came from Bologna, among them Francesco Francia (*ca.* 1500), Lodovici Caracci (1555-1619), and Guido Reni (1574-1642).

Courtesy Grace Line

BOLIVIANS BESIDE AN ANCIENT MONOLITH

The inhabitants derive their principal income from fruit industries, wine making, sugar refin-



BOLOGNA. PALAZZO COMMUNALE

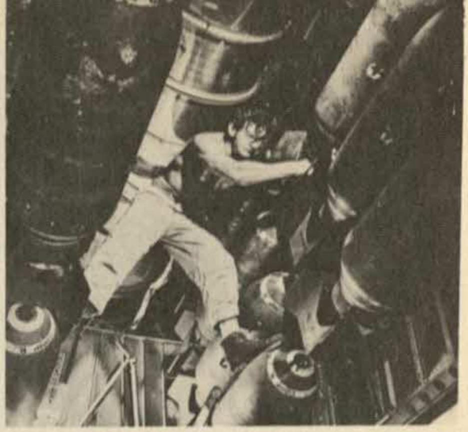
ing, electro-mechanical and chemical industries, dress manufacturing, and catering to the tourist trade. During World War II almost half the city was damaged by air attacks, although no actual fighting occurred in the city. The university, however, escaped undamaged. Population, 1945, 239,283.

Bolometer (*bô-lŏm′ê-tẽr*), an instrument used to measure minute quantities of heat. It is sometimes called actinic balance and thermic balance. It was created (1880) by S.P. Langley in connection with his studies of the distribution of energy in the infra-red portion of the spectrum. The essential part is the Wheatstone's bridge, a system of wiring for measuring electrical resistances. It has four arms, which may be diagrammed as a rhombus. Two arms are represented by a calibrated wire in which the resistance may be lengthened or shortened by a sliding contact. One arm may contain a standard resistance. The other arm, coated with platinum and carbon-black to make it highly sensitive to heat, conducts the unknown resistance to be measured. An electrical current passes through a galvanometer or oscillator or telephone to the sliding contact. When the four arms are in balance, there is no deflection of the galvanometer, or a minimum of buzz through the telephone. In the bolometer, the bridge is balanced at zero deflection. Then when radiant heat is directed into the measuring arm, the resistance increases in that arm and throws the galvanometer out of balance. This deflection indicates the amount of heat being recorded. The bolometer has been generally superseded by the Boys radiometer and the Pringsheim radiometer. See also *Radiometer*.

Bolshevists (*bŏl′shẹ-vĭsts*), or BOLSHEVIKI (Russian meaning "the majority"), the radical faction of the Russian Social Democratic party, which under Vladimir Ilich Ulyanov, better known as Nikolai Lenin (*q.v.*), set up the still-extant regime of Communism (*q.v.*) in Russia as a result of the 1917 Russian Revolution (*q.v.*).

Bolton (*bōl′tŭn*), or BOLTON-LE-MOORS, an important manufacturing city in Lancashire, England, on the Croal River, about 10 m. N.W. of Manchester. The chief buildings include the town hall, two museums, the church of St. Peter, the public baths, and five public libraries. Large quantities of coal are mined in the vicinity. It was noted for its manufacture of cotton and woolen goods as early as the 14th century, when Flemish merchants stimulated the industry. Population, *ca.* 170,000.

Bolton, FRANCES PAYNE, American Congresswoman, born Mar. 20, 1885, Cleveland, O. She was educated at Hathaway Brown School, Cleveland, and in France, then attended the Spence School for Girls in New York, graduating in 1904. She also studied at the Mannes Music School in New York City. It was after the death of her husband, Chester Castle Bolton, in 1939, that she entered politics, serving as a representative in Congress from 1940 to 1945. During her term in the House she was also a member of the important Committee on Foreign Affairs.



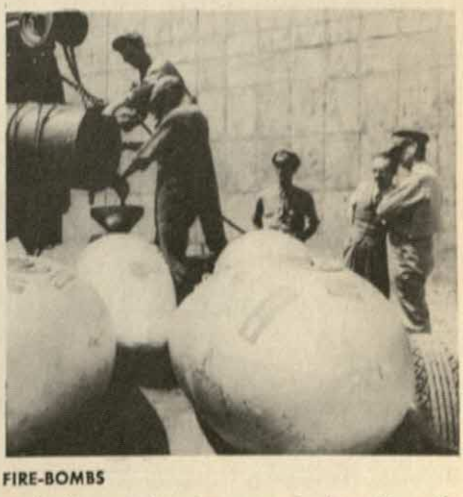
All photos on this page U. S. A. A. F. Photos

500-lb. DEMOLITION BOMBS

Placing a fuze into the tail of a bomb

Boma (*bō′mȧ*), a city and port of Belgian Congo, on the Congo River, not far from its entrance into the Atlantic. The largest vessels enter its port, giving it direct steamship communication with Ostend, Antwerp, and other cities of Europe. It has a large interior and foreign trade, manufactures of utensils and clothing, and is the political center of the district of Boma and the country lying inland. Population, about 5,000.

Bomb (*bŏm*), an agent of destruction used in war. Bombs are dropped on target from aircraft. Depth bombs, or depth charges, used for attacking submerged submarines, are dropped either from aircraft or ships.



FIRE-BOMBS

Mechanics turn harmless 110-gal. droppable tanks into fire-bombs by filling them with "fire jelly"

U. S. A. A. F. Photo

AMERICAN VERSION OF A ROBOT BOMB (JB-2)

A bomb usually consists of a body, stabilizer, and means of detonation. The body can be filled with either an explosive, chemical, biological, nuclear, or inert filler. Stabilizers are attached to the bomb body and may consist of sheet-metal fins, parachutes, or cloth streamers. The efficient destruction of the various types of enemy targets requires different types of bombs (fragmentation, blast, incendiary, armor-piercing, etc.).

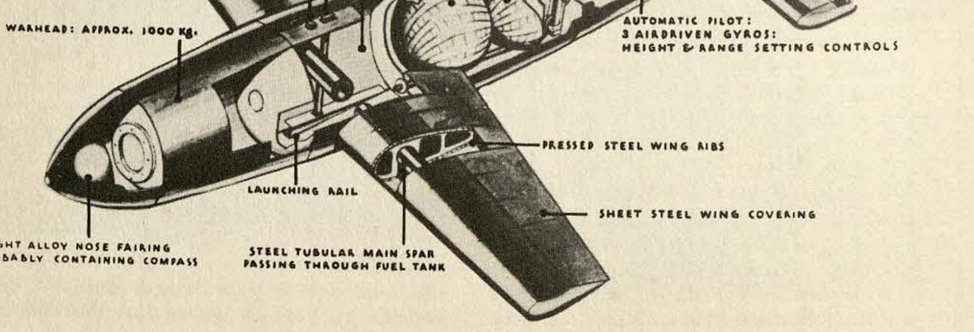
Various classifications of bombs use different types of explosives for maximum target destruction. When a high-explosive bomb is detonated, the charge is transformed, in an instant, into a very hot gas. This gas momentarily exerts enormous pressure. The gases then expand violently in all directions, shattering or displacing surrounding material. Shock and pressure waves are built up which throw fragments of the shattered case outward at a high velocity, causing destruction to the target area.

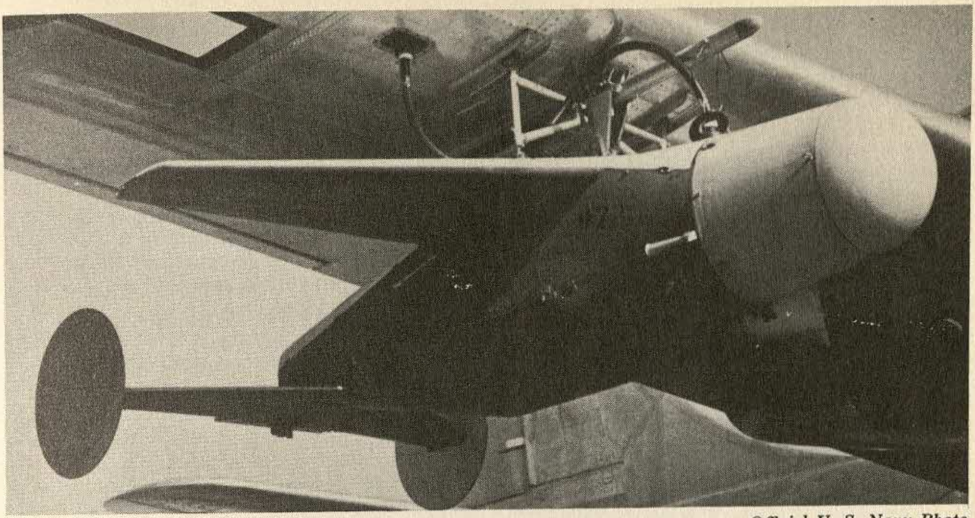
While the highly destructive nuclear (atomic) bombs are for use by all U.S. military forces, the so-called general-purpose bombs are the bombs used in the majority of bombing operations. These general-purpose bombs come in sizes of 2,000 lb., 1,000 lb., 500 lb., 250 lb., and 100 lb. About 50 per cent of the complete weight of the general-purpose bomb is explosive material.

The power of a nuclear bomb, or "nuclear weapon," as it is called, is expressed in terms of its total energy release (or yield) compared with the energy liberated by TNT (*q.v.*) when it explodes. Thus, a 1-kiloton nuclear bomb is one which produces the same amount of energy as the explosion of 1 kiloton (or 1,000 tons) of TNT. Similarly, a 1-megaton weapon would have the energy equivalent of 1,000,000 tons

GERMAN ROBOT BOMB OR "PILOTLESS PLANE"

Provisional sectional drawing





Official U. S. Navy Photo

RADAR-GUIDED "BAT" BOMBS

Close-up of "Bat" bomb in position on wing of Navy bomber. The "Bat," approximately 12 ft. long with a 10-ft. wing span, carries high explosives. After release from the plane, the "Bat's" radar installation guides the bomb to its target by radar echoes

(or 1,000 kilotons) of TNT. The earliest nuclear bombs, such as those dropped over Japan in 1945 and those used in the tests at Bikini in 1946, released roughly the same quantity of energy as 20,000 tons (or 20 kilotons) of TNT. Since that time, much more powerful weapons, with energy yields in the megaton range, have been developed. See also *Air Warfare; Atomic Bomb; Depth Bomb; Hydrogen Bomb; Military and Naval Progress.*

Bombardier Beetle (*bŏm-bĕr-dēr′*), a kind of beetle found in temperate and tropical countries. Many species have been described. These beetles are remarkable for the secretion of a pungent fluid in the anal glands, which, when they are attacked, is discharged with explosive force as a means of protection. This fluid somewhat resembles nitric acid in that it leaves a stain and has a burning sensation when applied to the skin. Immediately on making the discharge, the insect makes good its escape, but, if needed as a means of defense, the fluid can be thrown out several times consecutively.

Bombardment (*bŏm-bärd′mẹnt*), the act of attacking a city or fort by throwing bombs and shells to destroy the buildings and fortifications. This manner of attack is made chiefly on the larger cities and more important fortresses, usually on those that occupy a strategic point or in which a powerful army or valuable stores are kept by the enemy. In modern times most bombardments involve naval and military operations.

The term "bombardment" formerly signified an attack by concentration of artillery fire on undefended objects only, the purpose being to lower the morale of the defendants and to force the besieged area to capitulate for the protection of civilians. The term came to be more loosely applied as described above, however, and is today correctly used in that sense. See also *Gun.*

Bombay (*bŏm-bā′*), the chief seaport city of India and capital of a province of the same name. It is located on a small island in the Arabian Sea, which was visited by the Portuguese in 1509 and annexed by them in 1532. It was ceded to Charles II as a part of the dowry of the bride, the Infanta Catharine. In 1668 it was transferred to the East India Co., and, in 1685, became the principal presidency of their possessions. There is a closer resemblance between it and European cities than is seen in any other city of Asia. The harbor is one of the finest in the world, and is both commodious and sufficiently secure for the heaviest ships. It has many substantial business blocks and magnificent homes in the newer suburban districts, where the larger numbers of its European inhabitants reside. The public buildings include the custom house, the city hall, the public mint, several cathedrals, the offices of public works, the government courts, and the university. It has a well-organized and liberally patronized public school system, which is supported by taxation and government grants. Bombay has extensive manufacturing enterprises. The products include machinery, clothing, earthenware, textiles, and utensils. Its export and import commerce is very extensive. Population, approx. 1,500,000.

The province of Bombay, of which Bombay is the capital, lies in the western part of India. It is bounded on the north by Rajputana, Central India; east by the Central Provinces, Besar, and Hyderabad; south by Mysore and Madras; and west by the Arabian Sea. The area is 76,443 sq. m. The climate at Bombay is unhealthful, being hot and humid, but toward the northeast the district is favorable to Europeans. The chief rivers include the Indus, Tapti, and Nerbudda. Among the mineral deposits are salt and building stone. The rainfall is very heavy in the coast district, sometimes reaching 300 in., and heavy monsoons are frequent. Large areas still contain valuable forests, but in some regions deserts and saline lakes abound. The agricultural products embrace rice, wheat, barley, millet, cotton, and many varieties of tropical fruits. Railroads (comprising about 2,500 m.) have been built through all the fertile districts, on which are located numerous cities with large populations. The government of the district is administered by a resident governor, appointed by the crown, and a local legislative council and assembly. For administrative purposes it is divided into the four divisions of Central, Northern, Southern, and Bombay city. Prior to 1936 the province of Sind constituted a separate administrative district within Bombay, but in that year Sind was completely separated from Bombay. The following year the Presidency of Bombay (that territory under direct British rule) was given the status of an autonomous province. Population, over 20,000,000.

Bona (*bō′nȧ*), or BONE, a seaport city of Algeria, on a bay of the Mediterranean, 85 m. N.E. of Constantine. It has a good harbor and a large interior and foreign trade, and is connected with Constantine, Algiers, and other cities by railway. The chief buildings include those erected by the government and a number of mosques and churches. It has manufactures of tapestry, clothing, saddlery, and earthenware, and its trade is chiefly in live stock, wool, cereals, wax, fish, and tobacco. Iron mines and marble quarries are worked in the vicinity. The French have occupied Bona since 1832, from which time it has been growing steadily in commercial importance. Population, *ca.* 44,000.

Bonanza (*bô-năn′zȧ*), a term applied originally to the discovery of a vein of rich ore in a mine. It came into use in connection with the Comstock Lode in Nevada, where a number of rich deposits were found. Now it is used in speaking of any successful enterprise or good fortune. The term is one of the popular Americanisms (*q.v.*).

Bonaparte (*bō′nȧ-pärt*), CHARLES JOSEPH, statesman, born in Baltimore, Md., June 9, 1851. He was a grandson of Jérôme Bonaparte, King of Westphalia. In 1871 he was graduated from Harvard Univ. and in 1874 from the Harvard Law School, and began a successful practice in Baltimore, where he became prominent in reform movements. In 1902 he was made a member of the board of Indian commissioners, and two years later was chairman of the council of the National Civil Service Reform League. President Roosevelt made him Secretary of the Navy in 1905. He was succeeded by Victor H. Metcalf in 1907, when he became Attorney General. He died June 28, 1921.

Bonaparte, ELIZABETH PATTERSON, wife of

Courtesy Canadian Pacific Steamships

DE LISLE ROAD IN BOMBAY

Jérôme Bonaparte, born in Baltimore, Md., Feb. 6, 1785; died Apr. 4, 1879. She first met Jérôme Bonaparte, then a youth of 19, at Baltimore, who proposed marriage, which she accepted. The marriage was opposed by William Patterson, father of Elizabeth, and by Napoleon, brother of Jérôme. She was not permitted to land when reaching Lisbon, Portugal, and Jérôme proceeded to Egypt to consult with Napoleon, while Elizabeth sailed for Camberwell, England, where her son, Jérôme Napoleon Bonaparte, was born. The marriage was annulled in France by the imperial council of state, and on the application of Elizabeth she was granted a divorce in the courts of Maryland, though she sought by every legal means to maintain the right of her son to inherit the throne. She visited Europe after Napoleon's defeat at Waterloo, and again in 1819. She left a fortune of $1,500,000 to her grandsons, sons of Jérôme Napoleon Bonaparte.

Bonaparte, JÉRÔME, the youngest brother of Napoleon I, born at Ajaccio, Corsica, Nov. 15, 1784; died June 24, 1860. He studied in the college of Juilly, but soon entered the naval service in the Mediterranean, and later in the West Indies. In 1803 he married Elizabeth Patterson, the daughter of a Baltimore merchant. The marriage was not recognized by Napoleon and she was not permitted to enter France. He became King of Westphalia in 1806, and shortly afterward married a daughter of Frederick, King of Württemberg. After the second abdication of Napoleon, he retired to the kingdom of his father-in-law, and subsequently became governor of the Invalides and in 1850 was made marshal of France. Jérôme Napoleon Bonaparte, the son of his first wife, was graduated from Harvard and spent much of his life in France. He died in Baltimore, Md., June 17, 1870.

Bonaparte, JOSEPH, eldest brother of Napoleon I, born at Corte, Corsica, Jan. 7, 1768; died at Florence, Italy, July 28, 1844. His education was secured at the college of Autun, France. Afterward he studied law and returned to Corsica, where he became a member of the administration of Corsica under Paoli, in 1792. When his brother, Napoleon Bonaparte, rose to power, he entered upon a successful diplomatic and military career. In 1806 he became King of Naples with the name of Joseph, and two years later was made King of Spain. His dominion depended entirely upon the power of the French army, which proved insufficient to put down the Spanish insurgents, and he returned to France in 1813. After the success of the allied armies at Waterloo, he came to America and engaged in the pursuit of agriculture at Bordentown, N.J. While in America he assumed the title of Count de Survilliers. He returned to Europe in 1832.

Bonaparte, LOUIS, brother of Napoleon I and father of Napoleon III, born at Ajaccio, Corsica, Sept. 2, 1778; died July 25, 1846. He was educated at the school of Chalons, and accompanied his brother in the Italian campaigns and to Egypt. Distinguishing himself as a military man, he rose to the rank of brigadier general. He was induced by his brother to accept the crown of Holland, but to this responsibility he consented with reluctance. He administered the affairs of state with considerable ability, and sought in every way possible to promote the welfare of his subjects. His administration was not satisfactory to Napoleon, which caused him to abdicate at Haarlem, July 1, 1810, after which he retired to Rome to spend most of the remainder of his life. He was deeply affected by the death of his oldest son in 1831 and by the unsuccessful attacks of Louis Napoleon at Strasbourg and Bologna. Bonaparte married Hortense Beauharnais, the daughter of Josephine, in 1802. His death resulted from an attack of apoplexy.

Bonaparte, LUCIEN, prince of Canino, born in Ajaccio, Corsica, Mar. 21, 1775; died at Viterbo, Italy, June 29, 1840. His education was secured at Autun, Brienne, and Aix and was both liberal and well directed. He took up his residence at Marseilles in 1793, where he held several positions in local government and distinguished himself as a politician and republican orator. In 1798 he settled in Paris, where he soon became a member of the Council of Five Hundred, and the following year was made president of the Council. While in this official position he contributed largely to the downfall of the Directory, and Napoleon's ascent to power, Nov. 9, 1799. Napoleon sent him as ambassador to Spain and he afterward withdrew to Italy, where he devoted himself to sciences and arts, wholly indifferent to the military and political successes of his brother.

Bonaparte, MARIA LETIZIA RAMOLINO, mother of Napoleon I, born in Ajaccio, Corsica, Aug. 24, 1750; died Feb. 2, 1836. She married Carlo Bonaparte in 1767, who died in 1785, and subsequently removed from Corsica to Marseilles, where she was supported by a pension. When Napoleon became emperor, in 1804, she received the title of Madame Mère, and after his downfall she lived in Rome. She was considered a woman of beauty and frugality and much energy and pride.

Bonaparte, NAPOLEON. See *Napoleon I.*

Bonaventura (*bō-nä-vĕn-tōō'rä*), or BONAVENTURE, theologian, philosopher, born in Bagnorea, Tuscany, 1221; died in Lyons, July 15, 1274. Professor of theology in Paris (1253), general of the order of the Franciscans (1257), cardinal (1273), he was canonized in 1482. Called "The Seraphic Doctor," he was highly honored by his order. His works include *"Itinerarium mentis ad Deum"* and *"Breviloquium."*

Bond (*bŏnd*), in finance, the name of an instrument issued by a government or corporation as an evidence of debt, usually for the purpose of securing credit or borrowing money. Many kinds of bonds are issued, such as coupon bonds, mortgage bonds, sinking fund bonds, registered bonds, first mortgage bonds, etc. See also *Stock Exchange*.

Bond, in masonry, designating a method of "binding" together bricks in walls. The various types of bond—such as *English bond, Flemish bond, herringbone bond, diagonal bond*—vary in the direction of the brick and the side which is visible, thus creating different patterns in the surface of the wall.

Bond, SIR ROBERT, statesman, born at St. John's, Newfoundland, Feb. 25, 1857; died Mar. 17, 1927. He decided to take up a political career, and entered the legislature of the colony in 1882. Two years later he was made speaker of the House of Assembly and was appointed executive counsellor with the portfolio of Colonial Secretary in 1889, which he held until 1897, when he was appointed a delegate to act for Great Britain on the questions involved in treaties with France. Soon after he was appointed to assist Lord Pauncefote in negotiating a reciprocal treaty with the U.S., and was instrumental in completing what is known as the Bond-Blaine convention. As Premier and Colonial Secretary of Newfoundland, 1900-09, he concluded negotiations with the U.S. for reciprocal trade relations between this country and Newfoundland, known as the Hay-Bond treaty.

Bonded Warehouse (*bŏnd'ẹd wâr'hous*), a place where merchandise is stored under bond, awaiting payment of customs duties or excise taxes.

Bond Street (*bŏnd strēt*), a fashionable thoroughfare of London, England, situated between Oxford Street and Piccadilly, noted for its high class shops and custom-tailoring establishments.

Bone (*bōn*), the hard material that constitutes the skeleton or framework of mammals, reptiles, and birds. Its three purposes are to preserve the shape of the body, to protect the delicate organs and to serve as levers on which muscles may act to produce motion. In the early stages of life bones consist of *cartilage,* that is, cells massed together, except in the flat bones of the skull and shoulder blade, which consists largely of *fibrous tissue*. At maturity they contain about one part of animal and two parts of mineral matter. The proportions vary with the age; in early life they consist of nearly one-half to one-half, while in old age the mineral matter is greatly in excess. The mineral matter may be dissolved by soaking the bone in weak muriatic acid, which will make it possible to bend it like rubber. The animal matter may be burned in fire, the remaining portion forming a brittle mineral mass. From this it may be seen that bones obtain their elasticity from animal matter and their hardness from mineral substances.

The cartilage found in young persons or animals turns gradually into bone by a process called *ossification,* but the portions near the joints are long delayed in ossifying, as a means to overcome to a great extent the shock of a fall or sudden jar. For this reason the bones of children are tougher than those of older people, and are less readily fractured and heal much more quickly. In the body bones are moist, pinkish white in color, and covered with a tough membrane called *periosteum*. The interior is filled with marrow and permeated with blood vessels. All portions contain little cavities, from which tiny tubes radiate that serve as passages for the blood vessels to nourish the bones. These vessels permit the blood to circulate as freely through the bones as any part of the body, supplying new material when needed and carrying away the worn-out parts. From the broken ends of a bone the blood oozes and soon forms a gristly substance which holds them in place. The blood then slowly deposits bone matter, and in about six weeks a broken bone becomes united. In recent years the medical profession has developed the "bone bank," a supply of sterilized human bones so frozen and preserved that they may be used for grafting in bone surgery.

The bones of the human system resemble those of other animal organisms, but in shape and structure are peculiarly adapted to serve the human body. For convenience in study they are considered as bones of the three divisions: the *head,* the *trunk,* and the *limbs*. In form they are flat, as the shoulder blade; long, as the bones of the limbs; and short and irregular, as those of the wrist and ankle. The bones of the head are classified as eight skull and 14 face bones. These bones form a cavity for the protection of the brain and the organs of hearing, taste, smell, and sight. All these are immovable, except the lower jaw, which swings on a hinge. The bones of the trunk include eight in the cervical region, 37 in the thorax, five in the lumbar region, and four in the pelvis. The bones of the limbs include 64 in the upper extremities, and 60 in the lower extremities. The total number of bones in the body is about 210, these differing somewhat according to age, since several bones unite later in life. The size, form, and structure of the bones depend entirely upon the purpose they are to serve. Some are round and hollow and add lightness and strength; others are flat and broad to admit of large muscular attachment; while still others are short and solid to enable rapidity and facility in movement and to supply sufficient strength.

The bones of animals are gathered from slaughter houses and converted into articles of commerce. Ground into powder, they supply a valuable fertilizer for the production of cereals, vegetables, and fruits. In some localities their fats are first extracted; these are used in the manufacture of soap and lubricants. In powdered form they are prescribed as medicines and add largely to the elements that build up a system wanting in material strength. They also serve for making handles in cutlery, for sugar refining, and for making boneblack.

Boneblack (*bōn'blăk*). See *Charcoal.*

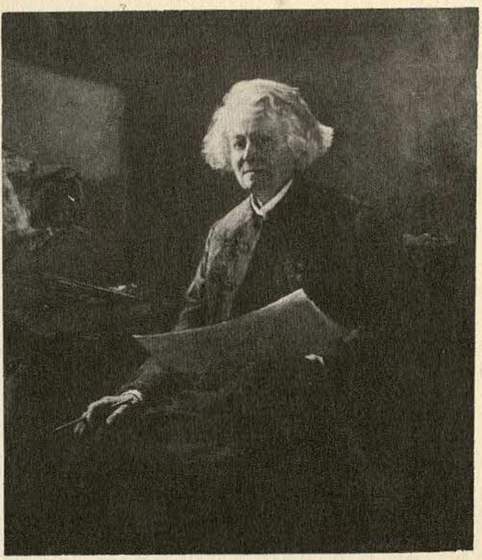
Bone Meal (*bōn mēl*), a preparation of crushed or ground bone from which gelatin and fat have been removed. The meal is used as a fertilizer and as a cattle food because of its high mineral content. It comprises some 20%-25% of phosphoric acid and some 2%-4% nitrogen. As a fertilizer it is popular because it is both slow-acting and safe.

Boneset (*bōn'sĕt*), a perennial plant of eastern North America, sometimes called thoroughwort. The species *Eupatorium perfoliatum* has large hairy leaves joined at their bases in pairs around the stem. The small composite flowers, usually white, form clusters at the end of the stem, which reaches about 2 ft. to 5 ft. in height. Occasionally still used in household remedies, the bitter infusion of the boneset leaf was once widely employed as a tonic and to treat fever—from which it derived the name agueweed. The name boneset is also applied to other plants.

Bonheur (*bô-nûr'*), ROSA (MARIE ROSALIE), painter, born in Bordeaux, France, March 22, 1822; died near Fontainebleau, May 25, 1899. Rosa Bonheur began her successful artistic career studying drawing with her father, an artist, and painting the domestic animals about her in serene landscapes. Her paintings were almost immediately successful at the Salon, and one, "The Horse Fair," a large canvas crowded with the violent but arrested movement of horses at the market place, remains a great public favorite even today. Through her painting, Rosa Bonheur achieved great social and financial as well as professional recognition, and became the first woman to receive the Grand Cross of the Legion of Honor.

Bonhomme Richard (*bô-nôm' rē-shär'*), the flagship used by John Paul Jones (*q.v.*) in the American Revolution, at the time he captured the British sloop *Serapis,* on Sept. 23, 1779. He had collected a number of vessels and was sent to the coast of Scotland, where he captured many prizes. Late in September he attacked the *Serapis* under Capt. Pearson, sailing broadside of that vessel and lashing the two boats together. A terrific hand-to-hand fight ensued. The British ship surrendered after a fight of three hours, but the *Richard* sank and its crew was transferred to the *Serapis.*

Boniface (*bŏn'ĭ-fās*), SAINT, the apostle of Germany, born at Crediton, England, in 680; slain by armed pagans in 755. He left England to take up missionary duties in Friesland. In 719 he was called to Rome and given unlimited power to do missionary work by the Pope. Backed by Charles Martel, Carloman, and Pepin, he attained great success in the Frankish kingdom. In 723 he was made a bishop and in 748 primate of all Germany. Resuming his missionary efforts in Friesland, he was assailed by a mob and killed. His remains were buried at the abbey of Fulda. His feast day is July 5.



Courtesy Metropolitan Museum of Art, N. Y.

MARIE ROSALIE BONHEUR

Boniface, the name of nine popes, of whom only three are of historic importance. BONIFACE I (418-22) opposed the Eastern Emperor Theodosius II when the latter sought to remove the Illyrian provinces from the jurisdiction of the Holy See and to place them under the authority of Constantinople. Boniface obtained the withdrawal of this attempt and renewed recognition of the position of the Pope as the first bishop of Christendom. Of primary importance was BONIFACE VIII, who was elected to the papacy in 1294, following a career in canon and civil law. Born *Benedetto Gaetani* in Anagni, Italy, *ca.* 1235, he died in Rome, Oct. 11, 1303. His pontificate marked the decline of the medieval power of the Church. Despite his avowed wish to maintain peace in Europe, his intervention in political issues led to expansion of existing dissension. Boniface issued (1296) the papal bull *Clericis laicos,* denying a ruler the power to tax the clergy without papal permission; and, in 1302, promulgated his *Unam sanctam,* in which he redefined the supremacy of the Pope in spiritual and temporal affairs. A harsh, sarcastic, but brilliant man, Boniface was not able to extend the powers of the Church at a time when nationalism was extremely strong in Europe. BONIFACE IX (Pope, 1389-1404) was the Roman pontiff during the residence at Avignon of anti-popes Clement VII and Benedict XIII. Boniface was responsible for the establishment of the Papal States as they were known in the 15th century and for the reestablishment of papal control of Rome.

Boniface, in Latin *Bonifacius,* also *Bonifatius,* Roman general of the late empire, died in 432. Boniface, although he had defended Marseilles from Visigothic invasion in 413, left Europe for Africa in 422 because he had supported Galla Placidia against her brother, the emperor Honorius (*q.v.*). Boniface became semi-independent governor of the Roman province of Africa. He was named count of Africa when he supported Placidia's son, Valentinian III (*q.v.*), against a usurper in 424. In 427, however, he refused to accept imperial curtailment of his power in Africa. The subsequent conflict probably encouraged Genseric (*q.v.*) to lead his Vandals (*q.v.*) into Africa in 429. Boniface defended Hippo against the invaders, but he lost the city after a siege in 430 and was again defeated in 431. Recalled to Italy (432) by Placidia to aid her against the Roman general Aëtius (*q.v.*), Boniface defeated the rival general but was wounded; he died three months later.

Bonin (*bō′nĭn*) **Islands** or, in Japanese, *Ogasawara Gunto,* a group of 13 small volcanic islands together with a number of smaller islets and rocks, having a total area of about 35 sq. m., in the western Pacific Ocean, lying about 600 m. s. of Tokyo, Japan. The three largest islands of the group are Chichi, Haha, and Muko; the chief port of the Bonins is located on Chichi. Agricultural products include sugar cane, bananas, pineapples, and some cattle. The Bonins were discovered (1543) by Spanish explorers, and were settled (1830) by a small group of Europeans. In 1877 Japan formally annexed the islands and in 1880 incorporated them into the prefecture of Tokyo. They were frequently bombed by U.S. planes in World War II, but were not occupied by U.S. forces until after the end of the war. They are currently administered by the U.S. Navy Dept. The prewar population, consisting mostly of Japanese, Koreans, and Formosans, was about 7,000.

Bonn (*bôn*), a city of Germany, formerly in Rhenish Prussia, on the Rhine River, about 16 m. S.E. of Cologne. Not primarily a manufacturing center, Bonn produces some porcelain. The chief buildings include several churches, among them the Münster church, which dates from the 11th century and is in the Romanesque style. Bonn is the seat of Friedrich Wilhelm Univ., which was reopened in 1848 but was founded as an academy in 1777 and as a university in 1786. The Beethoven House, in which the composer was born, now contains a Beethoven museum. The graves of B. G. Niebuhr, A. W. von Schlegel and Robert Schumann (*qq.v.*) are located in the city. Bonn dates from Roman times. During World War II the city was considerably damaged by bombs, and the Rhine bridge was destroyed during the German retreat. Bonn was the meeting place of the German Parliamentary Council which approved the Basic Law, or constitution, for the Federal Republic of Germany, on May 8, 1949. Bonn became the capital of the new republic on May 10 and was the scene of its first parliamentary session, which opened on Sept. 7, 1949. Population, 1958 (est.), 142,500.

Bonnard (*bôn-är′*), PIERRE, painter, born at Fontenaye-aux-Roses, France, Oct. 13, 1867; died at Le Cannet, Jan. 23, 1947. Bonnard abandoned law studies to enter the Académie Jullian, where he was a fellow student of Édouard Vuillard. His early enthusiams were Japanese art and the work of Paul Gauguin, influences he combined in his lithographs of the early 1890's. About 1900 he began to paint the intimate interiors and still lifes for which he became famous, but it was not until World War I that he developed his distinctive palette of brilliant oranges, yellows, and purples. Although the forms grew more abstract as the color became more intense, Bonnard's painting maintained its joy in nature throughout his long career.

Bonnell (*bŏ-nĕl′*), JOHN SUTHERLAND, clergyman, born on Prince Edward Island, Canada, Jan. 10, 1893. An interest in abnormal psychology led him to become an attendant at a hospital for the insane at 17. After serving in World War I, he studied for the ministry and was ordained as a Presbyterian minister in 1922. He received his D.D. in 1927. He was called to the Fifth Avenue Presyterian Church in New York City in 1935. Although not a professional psychiatrist, Dr. Bonnell considered psychiatry a vital accessory to the work of the ministry and became influential in spreading this belief among other Protestant churches. In 1961 he announced his retirement, to become effective in 1962. His many books include "I Believe In Immortality" (1959).

Bonner (*bŏn′nẽr*), EDMUND, prelate, born in Cheshire (?), about 1500; died in prison in the Marshalsea, Sept. 5, 1569. Ordained a priest about 1520, he became a protégé of Cardinal Wolsey (*q.v.*). He gained high standing under Henry VIII (*q.v.*), to whom he was fully subservient. He journeyed to Rome in 1532 in order to plead against the excommunication of the king after his marriage to Anne Boleyn (*q.v.*). Bonner, although he had supported the Anglican schism under Henry VIII, was opposed to much of the new Protestant doctrine and lost his London bishopric (to which he had acceded in 1540) under Edward VI (*q.v.*). After imprisonment, he returned to his see, upon the accession of Mary I (*q.v.*), and reportedly played a vicious role in the persecution of heretics during Mary's reign. Bonner lost his diocese once more and was later imprisoned when he refused to stop celebrating mass and refused to take the oath of supremacy of Elizabeth I (*q.v.*), half-sister and successor to Mary I.

Bonner (*bŏn′nẽr*), ROBERT, publisher, born near Londonderry, Ireland, April 28, 1824; died in New York, July 6, 1899. When young, he came to the U.S. and learned the trade of a printer. He became owner of the New York *Merchants' Ledger* in 1851, renaming it the *Ledger*. His paper gained an extraordinarily large circulation, partly due to his printing of many works of the best fiction writers of his generation, and partly to extensive advertising. He also was a well-known turfman.

Bonneville Dam (*bŏn′vĭl*). See *Dam*.

Bonney (*bŏn′ĭ*), WILLIAM H., an outlaw of the western U.S., known popularly as Billy the Kid, born in New York City in 1859; died at Ft. Sumner, N.M., July 14, 1881. He killed his first man in New Mexico at the age of 12. In the cattle wars of New Mexico, he was hired by a group of men to protect their interests in their struggle to gain monopoly of the stock-grazing business in the Pecos Valley. The Kid soon added a new group of killings to his list and was forced to retire to the hills to evade the authorities. He gathered a gang of 63 desperadoes about him; in the fierce gun battles that followed between his forces and those of the law, Bonney escaped uninjured. He managed to avoid capture for some time but was cornered and shot while visiting his sweetheart at Ft. Sumner. He was only 21 at the time, and it was his boast that he had killed 21 men. Because of his daredevil ways and his ability as a gunman, legends of the Kid's deeds spread rapidly throughout the New Mexico region. Today, he occupies a position in American folklore comparable to that of those other frontier killers, Wild Bill Hickok and Jesse James (*qq.v.*).

Courtesy B. Botkin, Croton-on-Hudson, N. Y.

WILLIAM H. BONNEY
Billy the Kid

Bonnivard (*bŏn′ĭ-värd*) or BONIVARD, FRANÇOIS DE, prelate and politician, born in Seyssel, Switzerland, *ca.* 1493; died in Geneva in 1570. In 1514 he became prior of St. Victor, Switzerland, and supported the revolt of Geneva against Duke Charles III of Savoy, who kept him in prison from 1519 to 1521, and again, in the castle at Chillon, from 1530 to 1536. Bonnivard was freed when Chillon was taken by the Bernese. He is the hero of Lord Byron's poem "The Prisoner of Chillon."

Bony Pike (*bō′nȳ pīk*), a ganoid fish native to North America. See *Gar*.

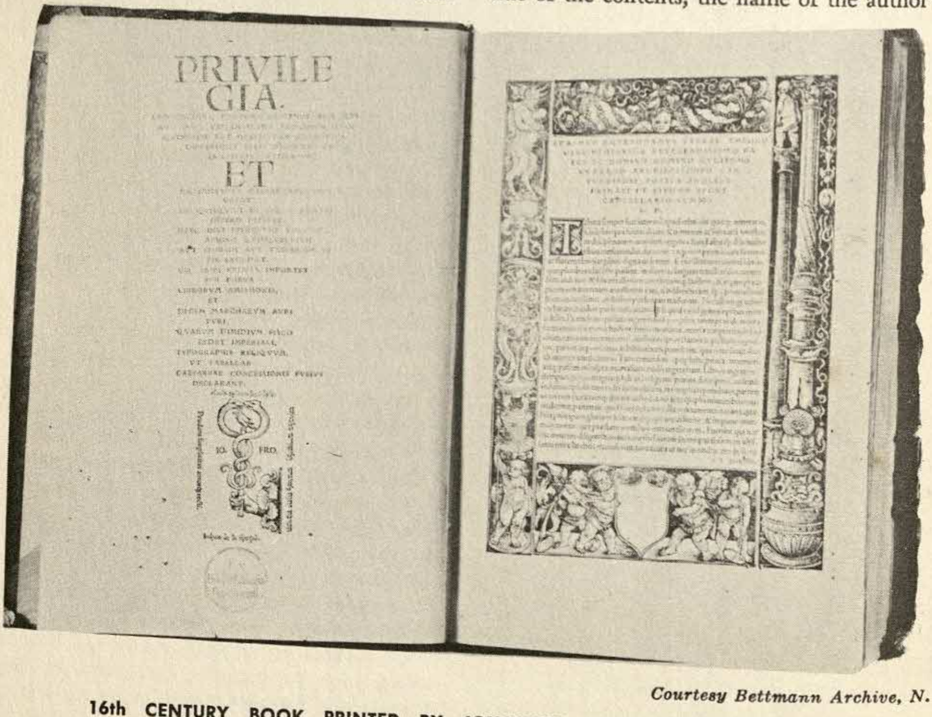
Booby (*bo͞o′bĭ*), a swimming bird of the genus *Sula*, allied to the gannet. The booby is a webfooted, fish-eating sea bird, found primarily in tropical and subtropical seas. Its nest is rudely constructed on rocky ledges near the sea and holds two or three eggs. Common varieties include the white-bellied booby (*Sula leucogaster*), native to the tropical western Atlantic, which is brown with a white abdomen, and the blue-faced booby (*Sula dactylatra*), native to the West Indies, which is white with a black tail and black wings and a bluish face. The booby acquired its name from its curiosity and lack of fear, which made it seem stupid to observers.

Book (*bo͝ok*), the common name applied to a written or printed composition forming a single volume. Early writings were preserved on monuments on the walls of buildings, and on smooth surfaces of stone cliffs and ledges. Such materials were chosen because of their durability. The Egyptians were the first to use the papyrus (*q.v.*) as a writing material. Literary manuscripts on papyrus rolls date as far back as the 6th century B.C. Babylonians and Assyrians used papyrus, but they also wrote on clay tablets, which were later baked to harden and preserve them. Bone, skins, and wood have often served as writing materials. The early books made of papyrus and skins of animals were in the form of a roll, occasionally written on both sides. When used in study or for reference, the rolls were wound back and forth. In Ezekiel 2:9-10, reference is made to this form in these words: "Lo, a roll of a book was therein; and he spread it before me; and it was written within and without." Books made in this form and transcribed by hand were very expensive.

The invention of paper and the printing press greatly reduced the cost of books, but enormous prices are still paid for rare and copiously illustrated works. Formerly the size of a book was taken from the number of leaves it contained. A fine example of this is found in the library of the Univ. of Göttingen, which contains a Bible that has 5,373 leaves. The leaves were represented in number by the folio, quarto, and octavo, and the page by the size of the paper, designated as royal, demy, or crown. Now the size of the page depends upon the number of leaves into which the sheet of paper that enters the book is folded. However, to express the size definitely, it is necessary that the size of the sheet be given in inches. A sheet of paper folded once, such as makes two leaves and four pages, is called a folio; folded twice, making eight pages, is called a quarto; folded three times, making 16 pages, an octavo. The common sizes used are 8vo for large books and 12mo and 16mo for ordinary sizes. Folio and quarto books are rare, owing to their size being too large and difficult to handle. Illustrations have been used in books from an early date. The books now commonly sold in the market contain illustrations of the two kinds known as half tones and line etchings, these having largely superseded the wood engravings used early in the printer's art, and the finer and more expensive steel engravings of recent times.

When the Alexandrian Library became generally known, a market for books originated, and since that time the bookstore has been a common institution. The book trade is now one of the most important industries, employing large numbers of men and women and involving investments of enormous sums of money. When papyrus and parchments constituted the books in use, the printer's ink of the present time was unknown, but instead vegetable inks were made. Others were secured from animals, especially from the cuttlefish. These were applied to the permanent material, after the writing had been temporarily placed on the leaves of the palm and the inner bark of the elm, ash, and maple, which were used instead of tablets. When the manuscript writing was completed, it was coated over with a durable and transparent varnish. This served to protect the writings, whether on vellum, parchment, or any other material used in writing.

The subject-matter of a book is called the *text.* It is preceded by the *title page,* on which are the title of the contents, the name of the author and



Courtesy Bettmann Archive, N. Y.

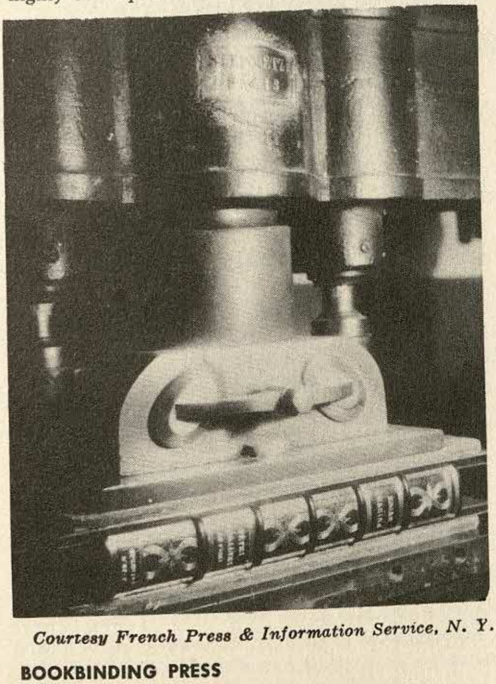
16th CENTURY BOOK PRINTED BY JOHANNUS FABAN OF SWITZERLAND

Faban, a personal friend of the literary leaders of his time, employed well-known artists, such as Hans Holbein, as illustrators. Note the "Privile Gia" on the left hand side of the photograph preventing the unauthorized reprint of a book publisher, the date of publication, and sometimes the notice of copyright, but the last mentioned usually follows the title page. The *preface* is a statement of the author or editor in chief, explaining the plan and scope, after which is the *table of contents* and the *text.* Some books have an index, which may either precede or follow the text. A collection of books constitutes a *library.*

Courtesy French Press & Information Service, N. Y.

BOOKBINDING BY HAND

Gold tooling, an art in itself, requires skill and a highly developed sense of beauty



Courtesy French Press & Information Service, N. Y.

BOOKBINDING PRESS

Its cover glued on, this book is placed under a press to dry

Bookbinding (*bo͝ok'bīnd-ĭng*), the art of stitching or fastening together the leaves of a book for convenient use and covering them with a suitable cover. When books were rare and costly because of great patience and time required for writing them, the binding was done and the covers decorated on the most elaborate plans obtainable. The type-setting machines and high-speed printing presses are modern, but even with the invention of rude printing in the first half of the 15th century the production and cost of books were revolutionized. To prepare a page in type form and take off impression after impression was a vast improvement over the slow work of the Egyptian vassal and the Roman slave, who were employed to do much of the copying in ancient Egypt and Rome. In those early ages the books in common use were inclosed in a binding of boards with corners plated and sides clasped. The books of the wealthy and noble were encased with ivory, embellished with gold, and ornamented with costly gems. Not only were the bindings elaborate, but the title pages were very costly. The rolls included in the writings on scrolls were richly carved and finished in ivory and costly gems.

Binding has become a separate industry in the larger cities, and in many instances it is entirely apart from the printing institutions. The printed pages are sent to the binder, where much of the folding and other essentials in binding are done by machinery. The chief processes in binding are the following: Folding the printed sheets; gathering them in consecutive order; pressing them to secure compactness; setting the back for cords and sewing them; rounding the back edges and applying glue; trimming the edges; binding the book to the sides in the binding material, whether paper, cloth, or leather; lettering back and sides; and completing edges by gilding or otherwise. Books may be *full, half,* or *quarter* bound. A full bound book is with the back and sides leather; half-bound is with the back and corners leather, and the sides cloth or paper; and quarter-bound is with the back leather and the sides cloth or paper. Many books are bound entirely in paper, cloth, and cloth-vellum. Others are bound in buckram, and the finer library books are in fabrikoid, calf, morocco, or russia.

Bookkeeping (*bo͝ok'kēp-ĭng*), a system of providing information of the financial condition and progress of a business enterprise. It is an important branch of instruction in all commercial schools. Many of the day and evening high schools in the U.S. and Canada provide instruction in the subject. It is the basis for accounting, and accountants must be thoroughly familiar with all phases of bookkeeping.

The system operates by recording all changes in the assets, liabilities, and capital of a business enterprise. The data collected are then arranged in the form of financial statements known as the *balance sheet* and the *profit and loss* or *income statement.* The first shows the financial condition of the business on a given date and the second shows the operations of the business for a definite period of time, usually one year.

The device for collecting the changes in the assets, liabilities, and capital is the fundamental equation formed by listing the money value of all one's assets and liabilities and then deducting the total amount of the liabilities from the total amount of the assets to find the capital. This statement is the balance sheet, which often is arranged as follows:

John Brown
Balance Sheet
December 31, 1946.

Assets		
Cash	$ 3,000	
Accounts Receivable	5,000	
Merchandise Inventory	15,000	
Furniture and Fixtures	1,000	
Total		$24,000
Liabilities		
Notes Payable	$ 3,000	
Accounts Payable	7,000	
Total		10,000
Capital		
John Brown's investment		$14,000

This provides the equation:

Assets $24,000 minus Liabilities $10,000 equals Capital $14,000, or A$24,000 — L$10,000 = C$14,000, which for bookkeeping purposes is arranged as follows: A$24,000 = L$10,000 + C$14,000. The equality sign is placed in a vertical position so that the equation can be expanded and cut into sections to form a book called the *ledger.* This results in the following form:

	Assets		
Increases	24,000	Decreases	
	Liabilities		
Decreases		Increases	10,000
	Capital		
Decreases		Increases	14,000

From this the general rule for bookkeeping is derived. The left side of the equation is called the debit side and the right side is called the credit side. Amounts entered in the equation result in one or more of the following:

On the left or debit side:	On the right or credit side:
Increases in assets	Decrease in assets
Decrease in liabilities	Increase in liabilities
Decrease in capital	Increase in capital

However, in actual use each individual asset, liability, and capital title must be arranged so that its increases and decreases can be recorded as they occur; therefore the same information is set up as,

	Cash		
Increases	3,000	Decreases	
	Accounts Receivable		
Increases	5,000	Decreases	
	Merchandise Inventory		
Increases	15,000	Decreases	
	Furniture and Fixtures		
Increases	1,000	Decreases	
	Notes Payable		
Decreases		Increases	3,000
	Accounts Payable		
Decreases		Increases	7,000
	John Brown, Capital		
Decreases		Increases	14,000

As changes in assets, liabilities and capital occur they are recorded daily in a book called the *journal* which contains a description of the transaction and an indication of the side, debit or credit, to which the item is to be transferred. Each title in the ledger is called an *account.* Abbreviations for debit and credit are *Dr.* and *Cr.,* which also are used as the abbreviations for debtor and creditor. Transferring items from the journal to the ledger is called *posting.*

To determine the mechanical equality of the ledger, the difference between the two sides of each account is found. A list of these differences is then prepared and constitutes the *trial balance.* If the trial balance does not balance, some error has been made. The mere fact that the totals in the trial balance are equal, however, does not prove that the work has been done correctly, although it is usually considered a good test of correctness.

This system is known as the double-entry bookkeeping system, which always keeps the total debits equal to the total credits in the journal and the ledger.

In most businesses it is convenient to divide the journal and use one or more special journals. If there are numerous sales of merchandise a special *sales journal* is provided. Whether or not a special journal should be used depends on the number of transactions of the same kind. Thus we may have many special journals such as *merchandise purchases, notes receivable, notes payable, cash receipts, cash disbursements,* etc. This subdivides the work and enables more people to work on the books at the same time and provides other economies. The ledger also may be divided. It provides for fixing responsibility and *control* by means of *controlling accounts.* All modern business makes full use of these and many other control and *labor-saving* devices. When control accounts are used in the main or *general ledger* the other ledgers are called *subsidiary ledgers.*

If a business manufactures the article it sells, the bookkeeping becomes more complex, although the basic principles of recording by the double-entry system remain the same. Raw material from which the article is made must be purchased. Labor must be obtained to produce the article. Machines depreciate as they are used to make the article, and other expenses such as light, heat, power, taxes, and various supplies incidental to the completion of the article must be determined, and all must be added to find the cost of the article manufactured. This has been developed into a system of bookkeeping which has become the basis for cost accounting as used in manufacturing. Single-entry bookkeeping is anything less than a complete record by double entry. In the simplest form it provides debits and credits for customers (accounts receivable) and creditors (accounts payable). It is seldom used, except by very small businesses.

Bookmaker (*bo͝oḳ′māḳ-ẽr*), one earning his livelihood by accepting bets, making up the betting books. Bookmaking is prohibited by statute in many states. In 1951 a Federal law was passed, requiring all bookmakers to buy a $50 tax stamp and to pay a ten per cent tax on all bets accepted. The law was upheld (1953) by a Supreme Court decision.

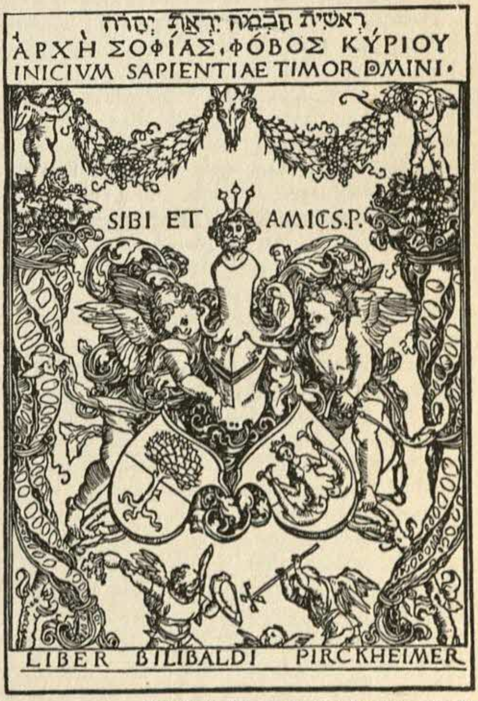
Book of Common Prayer (*ḳŏm′mŏn prâr*), the service book used in the Church of England and in related Anglican churches. The first version was published in 1549 under Edward VI. It was essentially a selection from the missal, breviary, and pontifical of the Roman Catholic Church, but it was written in English and was made uniform for the whole Church of England. This prayer book was revised in 1552, 1559, and 1662. In 1789 an American version of the Book of Common Prayer was authorized; it was revised in 1892 and 1928.

Book of Concord (*ḳŏn′ḳôrd*), a compilation of the authoritative confessions of faith of the Lutheran Church, published in 1580 on the 50th anniversary of the Augsburg Confession (*q.v.*), in an attempt to heal a widening breach between two factions in the church. Besides the Apostles', Nicene, and Athanasian creeds, the book contained the Augsburg Confession, the Apology of the Augsburg Confession, the Schmalkald Articles, Luther's larger and smaller catechisms, and the Formula of Concord. See also *Confessions.*

Book of Mormon (*môr′mŏn*). See *Mormons.*

Book of the Dead. See *Egypt.*

Bookplate (*bo͝oḳ′plāt*) or *ex libris* (Latin meaning "from the library"), a decorative label, giving the name of the individual owner of a book or of a library, usually pasted on the inside of the book's front cover. Originally, in addition to the name, such labels depicted the owner's coat of arms with the words *ex libris* placed at the top or bottom of the plate. The first bookplates appeared in Germany in the late 1480's in books owned by royal families and monasteries. Then crude, plain labels printed from woodcuts, they were turned into aesthetic features by Albrecht Dürer. One of his designs was a highly decorative bookplate, which he produced (1516) for his friend Willibald Pirckheimer; it was reproduced from a copper engraving. About the same time other German artists, among them Hans Holbein the Younger and Jost Amman, began designing bookplates. The fashion of using bookplates spread to other countries in the 17th century. In order to enhance the plates and make them more personal, quotations from the classics, fitting the respective owner, were used, and depictions of coats of arms often gave way to designs incorporating allegorical figures, symbols, flowers, and abstract ornamentation. Early bookplates and those of well-known bookowners, as well as those designed by famous artists, are collector's items, commanding high prices.


ראשית חכמה יראת יהוה
ἈΡΧῊ ΣΟΦΊΑΣ, ΦΌΒΟΣ ΚΎΡΙΟΥ
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Courtesy The Bettman Archive, N. Y.

BOOKPLATE BY ALBRECHT DÜRER

Bookworm (*bo͝oḳ′wûrm*), the book-destroying larva of any of several species of insects, including the deathwatch beetle, the spider beetle, or the drugstore beetle. Bookworms feed on the bindings and paste of books and often bore through the pages.

Boomerang (*bo͞om'ẽr-ăng*), a missile weapon invented and used by the natives of Australia. It is made from a curved stick, flat on one end and round on the other, 6 in. to 4 ft. long, *ca.* 2 in. wide, and ½ in. thick. The weapon is grasped at one end and thrown in a vertical or horizontal plane. Thrown horizontally, it has a skipping motion until it falls to the ground, but if the boomerang is thrown forward in a vertical plane it will describe an arc, returning to the thrower. The distance of its flight is determined by the angle of the vertical plane with the ground.

Boone (*bo͞on*), county seat of Boone County, Iowa, 40 m. N.W. of Des Moines. It is on the Chicago & Northwestern, the Fort Dodge, Des Moines, & Southern, and other railroads, and has manufactures of construction materials, machinery, brooms, brushes, and thread. Boone Junior Coll. is located here. Founded as Boone Station in 1865, it was incorporated as a town, under the name Montana, in 1866 and as a city in 1868. Boone adopted its present name in 1871 and annexed nearby Boonesboro (founded in 1851) in 1887. Population, 1930, 11,886; in 1950, 12,164.

Boone, DANIEL, frontiersman and Indian fighter, born near Reading, Berks County, Pa., Nov. 2, 1734; died near La Charette, Mo., Sept. 26, 1820. Of English Quaker parentage, he had practically no formal education, but was from boyhood a rifleman, hunter, and woodsman. About 1751 his family settled in the Yadkin valley of North Carolina. Boone was a teamster in the disastrous expedition (1755) of Gen. Braddock (*q.v.*). In 1767 Boone made the first of several trips to Kentucky; in March 1775, heading the advance party of Col. Richard Henderson's Transylvania Co., he blazed the Wilderness Road and built a fort at what was later called Boonesborough, in the present east central Kentucky, on the Kentucky River. (For some time a village in Madison County, it was later called Boonesboro.) During the Revolution, Boone saw much Indian fighting. Captured and adopted by the Shawnees in 1778, he managed to escape and warn Boonesborough of an impending attack by the Indians and British. He remained a militia officer after the Revolution. Boone served several terms in the Virginia legislature while Kentucky was still part of that state. In 1799, discouraged by law suits and faulty land claims, he moved to Missouri, then a possession of Spain. When this territory became part of the U.S. his land claims were again found faulty, but an Act of Congress (1803) restored part of the land to him. Many legends have grown up around Boone, but they are no more picturesque than the real facts. He was neither discoverer nor first explorer of Kentucky, but a leader of great courage and devotion, who did much to encourage the settlement of the West.

DANIEL BOONE

Boonesborough (*bo͞onz'bûr-ō*) or BOONESBORO. See *Boone, Daniel.*

Boot (*bo͞ot*). See *Shoes.*

Booth (*bo͞oth*), EDWIN THOMAS, actor, born in Bel Air, Md., Nov. 13, 1833; died in New York City, June 7, 1893. He was trained for the stage by his father, Junius Brutus Booth (*q.v.*), with whom he made his first professional appearance (1849), in Shakespeare's "Richard III." After touring for several years in Australia, Hawaii, and California, Edwin Booth appeared in Boston (1857) as *Sir Giles Overreach* in Massinger's "A New Way to Pay Old Debts" and as *Richard III.* His success was immediate and great, and he later gave memorable performances as *Shylock, Lear,* and *Hamlet.* In 1864 he leased the Winter Garden Theater in New York, where he produced and starred in a long series of Shakespearean dramas. In 1865 the assassination of Lincoln by Booth's brother, John Wilkes Booth (*q.v.*), caused Edwin Booth to retire temporarily from the stage, but in 1866 he resumed his Shakespearean productions at the Winter Garden with great success. When that theater was destroyed by fire (1867), he built his own theater, the Booth, which opened Feb. 3, 1869, but was a financial failure. Booth toured England (1861-62, 1880-82) and co-starred with Lawrence Barrett (1887-89) and Helena Modjeska (1889-90), all with outstanding success. In 1888 he founded The Players, a social club in New York. He made his last stage appearance at the Brooklyn Acad. of Music (1891) as *Hamlet,* his most famous role. Booth ranks as one of the great tragedians of his century.

Courtesy Museum of The City of New York

EDWIN BOOTH AS *HAMLET*

He was known for the refinement of interpretation and depth of feeling he gave his Shakespearean roles. He also showed a restraint that was unusual in his theatrical era.

Booth, EVANGELINE CORY, Salvation Army head, born in London, England, Dec. 25, 1865, daughter of William Booth, founder of the Salvation Army; died in Hartsdale, N.Y., July 17, 1950. She studied in England and the U.S. and in 1888 was appointed head of all Salvation Army operations in London. Her first post in North America was as commander in Canada (1895), where she served for nine years; she was later (1904-34) national commander of the Salvation Army in the U.S. She returned to London during World War I to direct the army's work abroad and was awarded the Distinguished Service Medal by President Woodrow Wilson in 1919 for her services. She became general of the International Salvation Army in 1934, the first, and to date the only, woman elected to that post, but served only five years before retiring to her home in Hartsdale.

Booth, JOHN WILKES, actor, assassin of President Abraham Lincoln, son of Junius Brutus Booth and brother of Edwin Thomas Booth (*qq.v.*), born in Harford County, Maryland, in 1838; died in Bowling Green, Va., April 26, 1865. He was an ardent supporter of the institution of slavery and shot and killed President Lincoln at a performance in Ford's Theater, Washington, D.C., on April 14, 1865. Booth broke his leg vaulting from the President's box after the shooting, but he managed to escape through a back door of the theater, mounted a waiting horse, and fled to Virginia. He was hidden in a barn in Bowling Green when he was shot, possibly by himself, after refusing to surrender to authorities.

Booth, JUNIUS BRUTUS, Shakespearean actor, born in London, England, May 1, 1796; died on a steamboat on the Mississippi River, Dec. 1, 1852. The son of a lawyer, he went on the stage against his father's wishes, making his debut in 1813. He appeared in theatrical productions in Holland and Belgium as well as England, and by 1817 he was considered a serious rival of Edmund Kean, England's most renowned actor of the day. In 1821 he married and, shortly after, sailed for America. His first U.S. appearance was in Richmond, Va., followed by engagements in New York and other cities. About a year later, Booth bought a farm near Baltimore, which became his home and the birthplace of his children, including Edwin T. and John Wilkes Booth (*qq.v.*). Junius Booth was considered a great tragedian, and his best roles were generally of classic villains, such as *Richard III, Iago,* and *Shylock*. In his later years, he sometimes behaved erratically, failing to appear for performances and insulting the audience when he did appear.

Booth, MAUD (CHARLESWORTH) BALLINGTON, reformer and author, born in Limpsfield, Surrey, England, on Sept. 13, 1865; died in Great Neck, N.Y., Aug. 26, 1948. Her father, a wealthy clergyman, became interested in the work of the Salvation Army. In 1884 she joined Catherine Booth in organizing an army in Paris and later did similar work in Switzerland. She married Ballington Booth in 1886. Subsequently they seceded from the Salvation Army and established the Volunteers of America, of which she became commander in chief on her husband's death (1940). She wrote "Sleepy Time Stories" (1889), "Lights of Childland" (1901), and other books.

Booth, WILLIAM, organizer and commander of the Salvation Army (*q.v.*), born in Nottingham, England, April 10, 1829; died in London, Aug. 20, 1912. After being converted at 15, he turned to evangelism. In 1852, at the age of 23, he was ordained a minister of the Methodist New Connection, an association he severed nine years later to become an independent revivalist preacher. He was married in 1855 to CATHERINE MUMFORD (1829-90), a preacher, later called mother of the Salvation Army, to whom much credit is given for his success. In 1878 Booth organized the Salvation Army, which since has spread generally to all Christian countries and has become a powerful agency in religious work. The strong element in the growth of the organization is that every convert receives an appointment to do some work in the plan of conversion. General Booth, as he was known, visited the destitute portions of London and other cities, in which the poorer classes were attracted to the services and interested in reformation. In 1880 the *War Cry*, a weekly publication, was established and 10 years later he published his famous work "Darkest England." His sons Ballington Booth and William Bramwell Booth and his daughter Evangeline Cory Booth (*q.v.*), were among his successors. WILLIAM BRAMWELL BOOTH (1856-1929), his eldest son, served as chief of staff of the Salvation Army, 1880-1912, succeeding his father as general in 1912, and holding the latter post until shortly before his death. BALLINGTON BOOTH (1859-1940), his second son, led the Salvation Army in Australia from 1885 to 1887, and in the U.S. from 1887 to 1896. With Maud (Charlesworth) Ballington Booth (*q.v.*), his wife, he withdrew from the army in 1896 and founded the Volunteers of America, a new philanthropic and religious organization.

Boothby (*bōōth'bĭ*), GUY NEWELL, novelist, born at Adelaide, South Australia, Oct. 13, 1867; died in England in 1905. He studied in his native city and in England, and subsequently made extensive tours of Asia and Australia. His writings have been widely read in Great Britain, Canada, and the U.S. Among the books are "Across the World for a Wife," "A Sailor's Bride," "Pharos the Egyptian," "Love Made Manifest," "Long Live the King," "Billy Binks, Hero, and Other Stories," and "The Viceroy's Protégé."

Boothe (*bōōth*), CLARE (MRS. HENRY ROBINSON LUCE), author and playwright. See *Luce, Clare Boothe.*

Boothia Peninsula (*bōō'thĭ-à pĕn-ĭn'sû-la*), formerly known as BOOTHIA FELIX, a peninsula of North America, the most northerly point of that continent, located between the Gulf of Boothia and McClintock Channel. It is within the Northwest Territories of Canada. Its length from north to south is 150 m. and the width is 50 m. Bellot Strait, on the north, separates it from Somerset Island, and in the south it contracts to a narrow isthmus, which connects it with the mainland. Sir John Ross discovered it in 1829 and named it after Sir Felix Booth, who had contributed to the expedition. The north magnetic pole was located on this peninsula in 1831, near the west coast and not far from Cape Adelaide; more recent calculations have indicated that it is shifting to the north and west of the peninsula.

Booth-Tucker (*tŭck'ẽr*), EMMA MOSS, officer in the Salvation Army, born in Gateshead, England, Jan. 8, 1860; died of injuries received in a train wreck, Oct. 28, 1903. She was a daughter of William Booth, general of the Salvation Army, and the wife of Commander Frederick St. George de Lautour Booth-Tucker. From 1880 to 1888 she had charge of the international training homes of the army and long held the rank of consul. In the latter position she had joint jurisdiction with her husband in the U.S.

Bootle (*bōō't'l*), a county borough of England, in Lancashire, on the Mersey River. Its manufactures include leather, flour, clothing, and machinery. Many business men of Liverpool, near which it is located, reside in Bootle. Population, *ca.* 85,000.

Bootlegging (*bōōt'lĕg-ĭng*), a U.S. term meaning the illegal production or distribution of liquor. The word grew out of the practice of carrying a flask of liquor in the leg of a boot. Bootlegging got its start in the 19th century when liquor taxes were high, and in the Prohibition era (1920-33) became a nationwide illegal industry allied with smuggling and gangsterism. The expression has also been used to describe the illegal manufacture and distribution of other products.

Bopp (*bŏp*), FRANZ, linguist, born in Mainz, Germany, Sept. 14, 1791; died in Berlin, Germany, Oct. 23, 1867. He studied at London, Paris, and Göttingen, and after 1821 taught at the Univ. of Berlin. His study of Sanskrit and the methods of comparative grammar which he developed in his work on Indo-European languages is the basis of present-day comparative philology. "*Vergleichende Grammatik*" ("Comparative Grammar") is his most famous work.

Borah (*bō'rà*), WILLIAM EDGAR, statesman, born at Fairfield, Ill., June 29, 1865. He studied in Illinois and at the Univ. of Kansas, was admitted to the bar in 1889, and in 1891 moved to Boise, Idaho, where he practiced law. He was elected U.S. Senator from Idaho in 1906 and served until his death; in 1924, he became chairman of the Senate Committee on Foreign Relations. After World War I he was a strong opponent of the League of Nations (*q.v.*), preferring to see this country stand apart. He strongly favored disarmament, however, and at

WILLIAM EDGAR BORAH

his suggestion, an adequate amendment was added to the Navy Appropriation Bill, 1921. U.S. ratification of the Kellogg-Briand Pact in 1929 was largely due to his influence. He died in 1940.

Borax (*bō'răcķs*), a crystalline, salt found native in certain mineral springs and on the shores of many lakes. The chief supply is derived from Tibet, Peru, Chile, Tuscany, Germany, and several sections of North America, especially in Nevada and California. It is prepared for commerce by washing the tincal, the crude material, with a solution of sodium hydroxide, and after dissolving in water it is treated with caustic alkali, after which the solution is evaporated and the borax crystallizes in six-sided prisms. The treatment varies somewhat with the condition in which the deposits are found. At Alameda, Calif., are refineries which treat the product secured from Clear Lake and other localities. There the crude material is dissolved in water and then treated with sodium carbonate, and the resulting solution is cooled in tanks, in which the borax forms on steel rods. Borax is used chiefly in soldering metals, glazing pottery and chinaware, preserving milk and meat, treating ulcers and skin diseases, and loosening dirt, and as an antiseptic and disinfectant.

Borchgrevink (*bôrķ'grĕ-vĭngķ*), CARSTEN EGEBERG, scientist and explorer, born at Oslo, Norway, in 1864. After studying in his native city and at the Royal Saxon School of Forestry, he emigrated to Australia, where he was surveyor and later instructor of languages at Cooerwell Coll., New South Wales. In 1895 he accompanied the whaler *Antarctic* upon an exploration of the south polar seas. He made a second exploring trip in 1898, when he sailed from London in the *Southern Cross,* landing at Camp Adare, South Victoria Land, September 1899, where he spent nearly a year in making investigations and exploring the surrounding regions. The following year he returned to New Zealand. In this tour of exploration he found a new island, Duke of York, situated in Robertson Bay, and discovered the south magnetic pole to be located at about 73° 20′ south. By making a tour with sledges he reached lat. 78° 50′, the most southerly point reached up to that time. He died in 1934.

Bordeaux (*bôr-dō'*), an important city in France, capital of the department of Gironde, on the Garonne River, about 60 m. from its mouth, but accessible by all vessels. It has railroad connection with the leading cities of France. Shipbuilding is an extensive enterprise. In the Roman period it was known as Burdigala, when it ranked as a commercial emporium. It was taken by Charles Martel in 735, captured by the Normans in the 9th century, transferred to the English crown in 1152, and restored to France in 1451. In the latter part of the war of 1870-71 it was the seat of the French general assembly, which had been driven there by the German army of invasion. At present it has a large commercial trade. Population, 1946, 253,751.

Borden (*bôr'dẹn*), GAIL, inventor, born at Norwich, N.Y., Nov. 16, 1801; died Jan. 11, 1874. He removed to Covington, Ky., when a youth, taught school in Mississippi in 1822, and subsequently became a surveyor. While on a surveying expedition he conceived the idea of making food suitable for emigrants and became the originator of *pemmican,* a meat biscuit. In 1856 he was granted a patent for his method of condensing milk. Afterward he took up the manufacture of condensed fruit juices and beef extract. He established milk-condensing plants at Elgin, Ill., and Brewster's Station, N.Y.

Borden, SIR ROBERT LAIRD, statesman, born at Grand Pré, Nova Scotia, June 26, 1854. He studied at Acacia Villa Acad. in Horton, was called to the bar in 1878, and built up an extensive practice in the supreme courts of Nova Scotia and Canada. In 1896 he was elected to the House of Commons and in 1901 became the leader of the Conservative party in the House of Commons. He was defeated for re-election for Halifax in 1904, but was returned for Carleton, Ontario. In 1911 he was in opposition to reciprocity with the U.S. and became premier, succeeding Sir Wilfrid Laurier, whose party was defeated. He was knighted in 1914 for efficient service. He resigned the premiership in 1920, and was elected president of the League of Nations Society of Canada, 1921, serving also in many other official posts. He died in 1937.

Bordentown (*bôr'dẹn-toun*), a city of New Jersey, in Burlington County, 6 m. S.E. of Trenton, on the Pennsylvania R.R. It is on the Delaware River and is important as a manufacturing point for the production of plastics, cranberry sauce, fertilizer, ironware, machinery, and clothing. It is the site of the Bordentown Military Inst. Settled in 1682, the city was incorporated in 1867. Nearby points of interest include "Ironsides," the home of Charles Stewart (now an industrial school), and a number of fine estates, including Joseph Bonaparte's former residence. Population, 1950, 5,497.

Border (*bôr'dẽr*), THE, the territory lying immediately on both sides of the frontier between England and Scotland. The region is noted for many historical battles and invasions important in the history of the Scotch and English. Among the noted forays of the Border is the Chevy Chase (*q.v.*). The writings of Sir Walter Scott commemorate Border warfare.

Bordet (*bôr-dĕ'*), JULES, bacteriologist and university professor, born in Soignies, Belgium, June 13, 1870; died in Brussels, April 6, 1961. He was graduated from the Univ. of Brussels as a doctor of medicine (1892) and worked at the

Pasteur Inst. in Paris until 1901, then founded a Pasteur Inst. for the province of Brabant in Belgium. He was a member of the medical faculty of the Univ. of Brussels (1907-35) and won the Nobel Prize (1919) for his method of diagnosing typhoid, tuberculosis, and other infectious diseases. A noted humanist, he joined other scientists in opposing the use of poison gas in wars (before the League of Nations, 1924) and in opposing nuclear tests (before the U.N., 1958).

Bore (*bōr*), or EAGRE, a tidal phenomenon at the mouths of certain rivers. Bores are common to rivers that gradually expand toward a wide mouth, and in which high tides occur. The spring flood tides drive great quantities of water from the sea into the river and form a kind of watery ridge, which rushes upward with great violence. The most celebrated bores are those of the Indus, Ganges, and Brahmaputra, of Asia, but the phenomenon is observable in other streams. In one of the branches of the Ganges the bore travels 70 m. in four hours, sometimes forming a wall of water 10 ft. high. In the Amazon it rises from 10 to 12 ft. The bore of the Petitcodiac River extends from the Bay of Fundy to Moncton, New Brunswick., about 95 m.

Borghese (*bôr-gä'zä*), CAMILLO, PRINCE, soldier, born in Rome, Italy, July 19, 1785; died Apr. 9, 1832. He served in the French army after the invasion of Italy and in 1803 married Pauline, a sister of Napoleon, who created him Duke of Guastalla and made him governor general of the provinces beyond the Alps. He sold the Borghese collection of antiquities and artistic treasures, which had been gathered by his father, to Napoleon, who removed them to France, but they were restored to him after the fall of the emperor. These treasures are now in the Borghese Palace, in the villa Borghese, at Rome.

Borgia (*bôr'jȧ*), CESARE, son of Pope Alexander VI, born in Italy in 1476; killed Mar. 12, 1507. At the age of 17 he was raised to the rank of cardinal and soon after made captain general. In 1499 he married Charlotte, daughter of Jean d'Albert, King of Navarre, and soon after accompanied Louis XII to Italy, where he undertook the conquest of the Romagna for the Pope.

Borgia, LUCRETIA, daughter of Pope Alexander VI, sister to Cesare Borgia, born at Rome in 1480; died June 24, 1519. She was married to Don Gasparo de Procida, son of the Count of Aversa, by proxy. When her father became Pope, he annulled this marriage. She was married to Giovanni Sforza, Lord of Pesaro, in 1493, but the marriage was dissolved by her father four years later, and she was given as wife to Alphonso, son of Alphonso II, King of Naples. Her third husband was assassinated two years after and she was married to Alphonso d'Este, son of the Duke of Ferrara, with whom she lived a peaceful life till her death 18 years later.

Courtesy Brown Bros., N. Y.

PRINCE CAMILLO BORGHESE

Courtesy Brown Bros., N. Y.

LUCRETIA BORGIA

Borglum (*bôr′glŭm*), GUTZON, sculptor, born of Danish parents in Idaho, March 25, 1867. He studied sculpturing and painting in San Francisco and France and exhibited at Paris and London. In 1902 he went to live in New York. He produced many highly regarded works of art, including a series of sculptures for the Cathedral of St. John the Divine; a memorial for the battlefield of Gettysburg; the "Mares of Diomedes," in the Metropolitan Museum, New York; and numerous statues, *e.g.,* of Philip Sheridan, James Smithson, Abraham Lincoln, and others. Work on the famous Mt. Rushmore (*q.v.*) National Memorial, in the Black Hills of South Dakota, with the heads of Washington, Theodore Roosevelt, Jefferson and Lincoln carved from the mountainside, began under his direction. Upon his death in 1941, his son Lincoln Borglum took over the work.

Borglum, SOLON HANNIBAL, sculptor, born in Ogden, Utah, Dec. 22, 1868; died Jan. 31, 1922; brother of Gutzon Borglum. Equestrian figures and horses were his principal themes throughout his career.

After winning a scholarship in 1897, he studied in Paris, was elected to the National Sculpture Society, and became an associate of the National Acad. of Design. His works include the "Burial on the Plains," "Stampede of Wild Horses" (Cincinnati Museum), "The Last Round-up" (Metropolitan Museum, New York), "On the Borders of White Man's Land," "Private Jones of the Confederate Army," a bronze statue in Lynchburg, Va.; an equestrian statue of Gen. J. B. Gordon in Atlanta, Ga., and a number of portrait busts and reliefs.

Bori (*bō′rē*), LUCREZIA, born LUCRECIA BORJA GONZÁLEZ DE RIANCHO in Valencia, Spain, Dec. 24, 1888; died in New York City, May 14, 1960. She made her operatic debut in the role of *Micaela* in "Carmen," in Rome in 1908, and subsequently appeared in the world's major opera houses. In 1912 she sang the title role in "Manon Lescaut" at the Metropolitan Opera House in New York City, and thereafter she was a regular member of the company until her retirement in 1936, with the exception of the years 1915-21, when illness prevented her appearance.

Boric Acid (*bō′rĭk ăs′ĭd*), a compound of boron, oxygen, and hydrogen. It is found native in Tuscany, the Lipari Islands, California, and elsewhere. The first discovery of this substance was made in 1777 in the lagoons of Tuscany, which are still the principal source of supply. Several lakes in California and Nevada yield borax in combination with various elements. It is derived from hot vapors which come naturally from thermal lakes and springs, and these vapors, which are largely boric acid, are absorbed by being passed through water. The acid turns blue litmus purple. It is used in the manufacturing of borax, in glazing porcelain, and in preparing certain pigments. Medically, it is used as a skin ointment and, in solution, as a mild antiseptic.

Boring Machine (*bōr′ĭng ma̤-shēn′*), a mechanical device used in boring holes in wood, rock, and metals. The auger (*q.v.*) is a tool for making holes in wood; the gimlet and awl are used where smaller openings are required. Drills are used in piercing stone and metals. The diamond, or star, drill, constructed of a hollow tube with diamond cutters at one end, is most effective in boring rock. The larger boring machines are operated by steam or compressed air. They do the work quickly and without loss from obstructions that usually prevent the lighter apparatus from cutting through the depths desired. Technically speaking, the distinction between drilling and boring is that in boring the work is turned, and the tool is held on a head that travels up and down the hole, while in drilling the work is stationary, and the rotating drill is lowered against it.

Boris Godunov. See *Godunov, Boris.*

Borneo (*bôr′nē-ō*), one of the islands in the Malay Archipelago, and the third largest island in the world. It has an area of 289,993 sq. m. Near the coast are located many small islands, of which Labuan, off the coast of Brunei, is the most important. Darwin considered Borneo and the East Indies to be the elevated portions of a vast continent submerged in the Pacific, which is probable. The surface is mountainous, attaining its culminating summit in Mt. Kinabulu, in the northern part, which has a height of 13,455 ft. While the island has no active volcanoes, it is frequently subject to earthquakes, which are, however, not of a serious nature. It is watered by numerous rivers, among them the Barito, Kapoeas, Mahakam, Rajang, and the Batang Lupar. Many of the rivers are navigable for small craft and add largely to the transportation facilities of the island. The rivers and lakes are infested by crocodiles and various animals common to swampy and marshy districts. Other wild animals include the tapir, elephant, deer, leopard, rhinoceros, buffalo, many varieties of monkeys, and birds of song and fine plumage.

The products of Borneo consist of rice, sago a (food stuff), tobacco, pepper, Manila hemp, rubber, coffee, cotton, and many varieties of tropical fruits. The forests yield an abundance of excellent timber and edible birds' nests. Borneo has extensive mineral deposits, including tin, iron, gold, petroleum, and manganese. The manufactures are not extensive, the most important being cotton fabrics, utensils, matting, and fancy baskets. Exports are large and greatly exceed the imports. The soil is fertile in all parts of Borneo, and the climate is, in most sections,

Courtesy Netherlands Information Bureau, N. Y.

ALONG THE WATERFRONT, SAMARINDA, BORNEO

good. The European influence is felt in commerce, transportation facilities, and communications. Parts of the interior are inhabited by the Dayaks, a native race mixed to some degree with the Malays. Other inhabitants are from the various islands of Indonesia. Mohammedanism is the principal religion.

The history of Borneo dates from 1511, when it was discovered by the Portuguese, but the first European settlements were not made until about 1600, when the Spanish and Dutch established trading posts. Borneo is divided into two sections. The northern part of the island is under British rule and is known as British Borneo. The southern part, formerly Dutch Borneo, consisted for a time of five autonomous territories which were constituent members of the Republic of Indonesia (*q.v.*); now one province, it is called Kalimantan. British Borneo comprises the colonies of North Borneo and Sarawak and the protectorate of Brunei. Sarawak was secured by the Englishman Sir James Brooke in 1841. Brooke, founding the only known family of white rajahs, purchased the region from the Sultan of Brunei, establishing an independent state under the protection of the British. Sarawak has an area approximating 50,000 sq. m. and a population (est.) of 500,000. Capital and chief town is Kuching. Brunei, to the northwest of Sarawak, came under the protection of the British government by treaty (1888). Area of Brunei is 2,226 sq. m.; population, over 30,000. The capital is Brunei, situated on the Brunei River, about 10 m. from the mouth.

The region which was formerly known as Dutch Borneo comprises the greater part of the island. The Dutch, with the creation of the Dutch East Indies Company in 1601, assumed control of a large part of the East Indies. With the dissolution of the Dutch East Indies Company in 1798, the colonies passed under the control of The Netherlands government. During World War II, Japanese troops invaded Borneo in December 1941; Australian and U.S. forces and some units of The Netherlands Indies army began the reconquest in May 1945, and after the surrender of the Japanese Empire (August 1945), the enemy quit its holds. Later, Dutch Borneo (area, 215,000 sq. m.) was divided into the five territories of West Borneo, Great Dayak, Bandjar, Southeast Borneo, and East Borneo which in 1950 became a part of the independent state of Indonesia (*q.v.*). Total population of Borneo, *ca.* 3,000,000.

Bornholm (*bŏrn′hŏlm*), a Danish island and county in the Baltic Sea, s.w. of Sweden. The steep-cliffed but fertile island is about 23 m. long and 18 m. wide; its approaches are dangerous, through deep water to reefs, sandbanks, or precipices. Reaching 530 ft. at its greatest elevation, the island has good farmland. Bornholm has sandstone, limestone, marble, granite, and kaolin deposits, but is mainly devoted to fishing and farming. Population (1949 est.), 49,500.

Bornu (*bôr-nōō′*), a province of Nigeria, in the central part of the Sudan, Africa, with an area of 45,900 sq. m. It extends southwest from Lake Tchad, which forms its northeastern limits. The two principal rivers are the Chari and Yobe, which flow into Lake Tchad from the west.

Courtesy Bettmann Archive, N. Y.

BATTLE OF BORODINO, 1812

From a drawing by Albrecht Adam (1786-1862)

Bornu is exceedingly fertile and produces rice, indigo, cotton, tobacco, corn, cocoa, palm oil, ivory, and fruits. Many kinds of animals, including horses, cattle, sheep, elephants, and buffaloes, are reared extensively. The inhabitants are chiefly Kanuri Negroes, their religion is Mohammedan. Maidugari is the capital and chief trading point; other cities include Kuka and Dikwa. Population, over 1,000,000.

Borodin (*bŏr-ŏ-dĭn′*), ALEKSANDER PORFIREVICH, Russian composer and chemist, born in St. Petersburg (now Leningrad), Nov. 11, 1833; died there, Feb. 27, 1887. Borodin began to study music when very young, and at 14 composed a concerto for the flute. He also studied medicine and chemistry and later held a professorship in chemistry.

For a time, composing served as his recreation, but later he joined Balakirev (1837-1910) and took up music seriously. He is best remembered for his three symphonies, "In the Steppes of Central Asia" (1880, a tone poem), and "Prince Igor," an opera which was finished by Rimsky-Korsakov and Glazunoff.

Borodino (*bŏ-rŏ-dyê-nô′*), a village of Russia, 70 m. s.w. of Moscow, near the Moskva River. It is celebrated as the site of a battle on Sept. 7, 1812, between the Russians under Kutusov and the French under Napoleon. The French army consisted of about 125,000 men, the Russian army was somewhat smaller, and the struggle was chiefly an attempt of the French to capture the lines of redoubts and press on to Moscow. Napoleon made three assaults and remained in the field, while the Russians retreated in good order, but Moscow was soon after occupied by the French. Both sides claimed the victory, but it was disastrous to the French in that the Russians burned Moscow and destroyed the stores. About 75,000 were killed and wounded in the Battle of Borodino, called by the French the Battle of Moskva, from the Moskva River.

Boron (*bō′rŏn*), a nonmetallic chemical element (symbol B; atomic number, 5; atomic weight, 10.82). Its two forms are crystalline and amorphous and it occurs in nature as boric acid or in combination with various borates. One of the first to isolate boron was Sir Humphrey Davy (1808). Its principal commercial use is in the making of boric acid and such borates as borax.

Borromean Islands (*bŏr-ō-mē′ạn*), a group of four small islands in Lake Maggiore, Northern Italy. They are rocky and famed for their beauty. Isola Bella, the most celebrated of the group, has a beautiful palace belonging to the Borromeo family, for whom the islands are named. Isola Madre, the largest island, has groves of orange trees and gardens of tropical flowers planted by Count Vitaliano Borromeo (died 1690).

Borromeo (*bôr-rō-mā′ô*), SAINT CHARLES or SAINT CARLO, Roman Catholic prelate, born in Arona on Lake Maggiore, Italy, Oct. 2, 1538; died in Milan, Nov. 4, 1584. Nephew of Pope Pius IV (*q.v.*), he had a brilliant ecclesiastical career. Made a cardinal in 1560, he participated in the final years of the Council of Trent (1545-63). He was noted for his zealous participation in the Catholic Counter-Reformation movement and made bitter enemies of several religious orders by his attempts to restore ecclesiastical discipline. His political activity in Switzerland paved the way for the formation (1586) by the Swiss Catholic cantons of the "Golden" or "Borromean" league. He was canonized in 1610.

Borzoi (*bôr′zoi*), another name for the Russian wolfhound, a large, graceful hunting dog with a long, narrow head and a soft, silky coat; first bred in Russia. It is generally white, with markings ranging from lemon to black, and stands as high as 31 in. See also *Dog*.

Bosch (*bôsh*), CARL, chemist, born in Cologne, Germany, Aug. 27, 1874; died April 27, 1940. He studied engineering and foundry work at the Charlottenburg Polytechnic, but entered Leipzig Univ. in 1896 to take up chemistry. Three years after his graduation he was employed by a Ludwigshafen firm where he began working in the new industry of synthetic indigo. Just after the turn of the century he began independent research on nitrogen compounds, the chief interest of most scientists at that time. He went to work for the I.G. Farbenindustrie in 1907, and after the invention (1908) of the Haber process for the synthesis of ammonia, he was commissioned to adapt it for commercial use. In 1931 he received the Nobel Prize, with Friedrich Bergius, for work in that field. He was general manager of I.G. Farben by 1919, and six years later became chairman of its board of directors. He resigned that post in 1935 when he assumed complete control of the firm, handling economic issues and acting as an adviser to the government until his death in 1940. Bosch wrote numerous works on nitrogen in industry and received numerous distinctions, among them honorary degrees from many German universities.

Bosch, HIERONYMUS, Dutch painter, born about 1450 at Herzogenbosch; died in 1516. He uses the naturalistic descriptiveness of his time to revive and enliven all the fantastic, ghostly aspects of the dying Middle Ages, thus indulging in scenes of an eerie character, inventing ever-new combinations of the real and an imaginary world. Whether developed within a fantastic landscape or against the background of a bizarre architecture, whether depicting the playful environment of Paradise or an Adoration of the Magi, Hell or the Temptation of St. Anthony, his paintings always give the beholder the task of finding visual enjoyment through the many details that make the charm of this master's art. When Bosch depicts genre scenes of proverbial or symbolic character, he reveals his mastery of characterizing types in a way which leads directly to his great follower Pieter Breughel the Elder (see *Breughel*). In the quaintness and nightmarish mood of his paintings, Bosch suggests the phenomena of modern surrealism.

ADORATION OF THE MAGI
PAINTING BY HIERONYMUS BOSCH

Courtesy Metropolitan Museum of Art, N. Y.

Bose (*bōs*), SUBHAS CHANDRA, statesman, born in Bengal in 1897; died Aug. 19, 1945. Educated in India and at Cambridge, he was given a berth in the Indian Civil Service in 1920 but resigned upon the outbreak of the civil disobedience campaign in India (1921). After a brief jail sentence, he became the right-hand man of C.R. Das, then editor of the *Nationalist Daily Forward*. Bose's election as chief executive officer of the Calcutta Municipality in 1924 was followed by his election to the Bengal National Congress in 1926, and he became its president in 1927. He went with Nehru (*q.v.*), as one of the two general secretaries, to the All India National Congress, helped form the India Independence League (1928), and was elected to the Bengal Legislative Council in 1926 and in 1929. Cast into jail for his political activities, he was released because of ill health in 1932. He later resumed presidency of the Bengal National Congress and was re-elected in 1939, but resigned after a dispute with Gandhi. He then grouped his own followers into a "Forward Block" which acted the part of a rural organizing body for the Congress. The only Congress Party leader to go over to the Axis in World War II, he headed the Japanese-sponsored government at Singapore in 1942.

Bosna-Serai (*bŏs′nȧ-sĕr-ī′*), the Turkish name of Sarajevo (*q.v.*), the capital of Bosnia-Herzegovina, in Yugoslavia, on the Miljacka River, *ca.* 157 m. s.w. of Belgrade.

Bosnia and Herzegovina (*bŏz′nĭ-ạ, hĕr-tsạ-gô-vē′nạ*), a region of Yugoslavia, formerly of Austria-Hungary, surrendered with Herzegovina and Novi Pazar by Turkey in the treaty of Berlin in 1878. The area, including Herzegovina and Novibazar, is 19,904 sq. m. In Bosnia the surface is mountainous, including ranges of the Dinaric Alps, but toward the south, in Herzegovina, it is level or gently undulating. A large part is fertile and well adapted to agriculture. It is well watered by the Bosna, Save, Drina,

JACQUES BÉNIGNE BOSSUET
Engraving by Robert Nanteuil (1623-1678)

and Verbas rivers and is rich in forests and minerals. The products are wheat, barley, tobacco, hemp, rye, buckwheat, and domestic animals. Copper, coal, iron, and salt are mined profitably. It has manufactures of sugar, matches, chemicals, woolen and cotton goods, iron products, firearms, machinery, leather, and dairy products. Sarajevo or Serajevo (pop., *ca.* 125,000), is the capital and largest city. The principal cities, besides the capital, are Mostar (pop., *ca.* 25,000) and Banja Luka (*ca.* 35,000). The chief religious denomination is Serbian Orthodox, followed by the Mohammedan faith. The formerly considerable Jewish minority was wiped out during the German occupation in World War II. A Serbian dialect is spoken chiefly. The territory included in the province was a part of Dalmatia and Pannonia in the time of the Romans. It belonged to Turkey from 1463 until it was given (1878) to Austria-Hungary, who annexed it in 1908 by proclamation. It became part of Yugoslavia in 1918 and in 1941, during World War II, was invaded by the Axis Powers, being incorporated into the Axis-dominated kingdom of Croatia, May 18, 1941. In April 1945, after liberation from German rule, a new regional government (within the federal state of Yugoslavia) for Bosnia-Herzegovina was established at Sarajevo. Population, 1921, 1,998,375; in 1961, 3,274,886.

Bosporus (*bŏs′pô-rŭs*), a narrow strait in southeastern Europe, connecting the Black Sea and the Sea of Marmora (*qq.v.*), and separating Turkey-in-Europe from Turkey-in-Asia. The strait is about 20 m. in length and varies in width from ½ m. to 2¾ m. Throughout history the Bosporus has been of great strategic importance, since the strait, together with the Dardanelles (*q.v.*), provides the only outlet for commerce from the Black Sea to the Mediterranean. The region is also noted for its beautiful scenery, and many large residences line the European shore. Fortifications of the Bosporus were completed by the Turks in 1452, and the strait has remained under Turkish control since that time. See also *Turkey.*

Bossuet (*bô-sü-ĕ′*), JACQUES BÉNIGNE, pulpit orator, born in Dijon, France, Sept. 27, 1627; died in Paris, April 12, 1704. In 1652 he was ordained a priest and made canon of Metz, where he became renowned as an orator. Later he delivered a number of sermons before Louis XIV in Paris. Subsequently, he became tutor to the dauphin, and in 1681 he was made bishop of Meaux. He became noted as a controversialist through his argument with Fénelon (*q.v.*), in which he was supported by the pope; he also favored the revocation of the Edict of Nantes. His chief writings include "Discourse on Universal History" and "Funeral Orations."

Boston (*bôs′tŭn*), a city and port of entry in eastern Massachusetts, capital of the Commonwealth of Massachusetts, seat of Suffolk County, and 13th largest city in the U.S. It has a land area of 47.8 sq. m. Its flourishing harbor lies on an arm of Massachusetts Bay, at the confluence of the Charles and Mystic rivers.

Much city land is given over to parks and open spaces. In 1634, some 48 acres of ground in the center of Boston were reserved for use as a Common. Adjoining the Common is the Public Garden (24 acres), planted with a great variety of trees and ornamented with flower beds (especially fine in tulip season). Here also is an equestrian statue (1869) of George Washington, by Thomas Ball; it is on the axis of Commonwealth Ave. and can be seen between the trees as one looks down the avenue toward the Public Garden. In the garden there is an artificial pond on which the well-known "swan-boats" ply. Franklin Park (527 acres), which houses a zoo, the Embankment by the Charles River, the Fens, the Arnold Arboretum (of great botanical interest), Kings Chapel churchyard, and the Old Granary Burying Ground may also be mentioned in this connection.

Boston streets lack the monotonous uniformity characteristic of most North American cities; this is especially the case downtown. The narrow, winding, and irregular streets cause some traffic congestion, but they are the cherished and picturesque remains of colonial times and the early 19th century. In the newer (1856) filled-in land, known as the Back Bay, the streets are straight and broad, and Commonwealth Ave. is planted with rows of trees.

Long, winding Washington St. and the short streets off it constitute the old shopping district, but there has been a strong tendency for fashionable dress-shops and the like to move uptown to lower Boylston and Newbury Sts., that is, nearer to the Ritz, Statler, and Sheraton-Plaza hotels. Beacon Hill and the Back Bay are the in-town residential districts.

Boston is rich in structures of historic and architectural interest. Among these may be mentioned the Old State House (1748) and the present State House (1795), built by Charles Bulfinch (the wings, however, were added in later years). The Old North Church (1723), the Old South Meeting House (1729), King's Chapel (rebuilt in 1754), and Faneuil Hall (1742) are other 18th-century examples of historical interest. Other noteworthy buildings are the Cathedral of the Holy Cross (Roman Catholic); St. Paul's Cathedral (Protestant Episcopal); Trinity Church, a Romanesque structure by Henry H. Richardson; and the Boston Public Library (1888), with murals by John Singer Sargent and Edwin A. Abbey. The Wilbur and Colonial theaters remain as legitimate theaters from pre-World War I days. Fenway Park is the home of the Boston Red Sox, the city's American League baseball team. Boston also is the home city of professional basketball (Celtics), hockey (Bruins), and football (Boston Patriots) teams.

BOSTON'S OLD STATE HOUSE, BUILT IN 1748

At the head of State Street in the heart of Boston's business section, this structure now houses a wealth of old furniture, paintings, documents, ship models, and other souvenirs of early America

Courtesy Boston Chamber of Commerce

Transportation: Boston is served by several railroad lines, including the New York, New Haven & Hartford, the Boston and Maine, and the Boston & Albany. Boston's subway was the first built in the U.S., in 1895. Logan Airport, in East Boston, is one of the most centrally located air terminals in the U.S. The Port of Boston has more than 250 docks, comprising 30 m. of berthing space for large, ocean-going ships. The city houses the headquarters of Naval District No. 1 and a U.S. naval station and shipyard.

Thirteen miles from Boston Lightship, closer to the open sea than any other major port terminal facility, lies Castle Island. The area consists of 18 acres owned by the U.S. government, and 76.5 acres owned by the Commonwealth of Massachusetts, under lease to the Federal government. At present it is an island in name only, having been joined to the mainland some years ago in order that its recreational, commercial, and military uses could be exploited more fully.

The city's military complexes include the Boston Army Base and the historic Ft. Independence, once the oldest military post in the U.S. continually occupied for defense.

Commerce and Industry: Boston is the chief city of New England. It is an insurance center and the seat of Federal Reserve Bank, District 1.

OLD NORTH CHURCH

The church has a plaque commemorating its part in the ride of Paul Revere to warn Lexington and Concord

Courtesy N.Y. Central System

The city's industry is diversified, but electronics, publishing, and printing are most important; food products, clothing, woolen and worsted goods, electrical machinery, and footwear are the leading manufactures. It is a principal fishing port and the wholesale wool center of the world. The export and import trade represents an annual value of about $500,000,000. The city is the center of a standard metropolitan statistical area (969 sq. m.; pop., 1960, 2,589,301) made up of Suffolk County and parts of Middlesex, Essex, Norfolk, and Plymouth counties, which in 1958 produced a value added by manufacture of $2,466,644,000. The city alone contributed to this total a value added of $742,602,000.

EDUCATION: The public-school system enrolls about 90,000 pupils annually, and an additional 45,000 pupils are educated in parochial schools. Boston's institutions of higher learning include Boston Univ., Northeastern Univ., Boston Coll., Emmanuel Coll., Simmons Coll., Suffolk Univ., and the New England Conservatory of Music.

Boston has long been widely known as a musical center and for its educational institutions, libraries, and art galleries. The public library is one of the finest in the U.S., and the Athenaeum houses a famous collection of books. The Museum of Fine Arts, the Isabella Stewart Gardner Museum, and the Museum of Science are important institutions. Many learned societies maintain their headquarters in the city.

GOVERNMENT: Incorporated as a city in 1822, Boston operates under a charter of that date (later amended), and its officials include a mayor, elected for a four year term, and a nine-member council, elected for two-year terms.

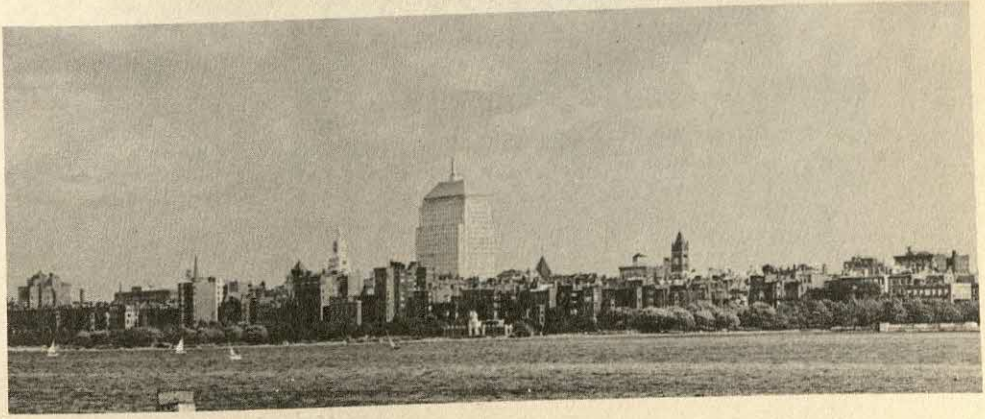
HISTORY: The accepted day of the founding of the city is Sept. 17, 1630, when the settlement made by John Endicott and John Winthrop (*qq.v.*)—which had been known as Shawmut to the Indians and Trimountaine to the settlers—was named Boston, after the Boston in Lincolnshire, England. In 1632 it was made the capital of Massachusetts Bay Colony. The earliest settlers were Puritans, and the church they founded was known as Congregational and was in the nature of a state church. The first form of government was by the system of town meeting. After a new charter was granted by William III in 1692, the theocratic nature of the government was modified and the rights of Anglicans protected. In 1750 four denominations other than Congregationalists were represented.

From 1761 on, Boston assumed the principal role in the various growing disputes of the American colonists with the mother country. In 1765 occurred the riot in which the house of Thomas Hutchinson (*q.v.*), the lieutenant governor, was sacked and his library destroyed. In 1770, on King St. (now State St.), the Boston Massacre (*q.v.*) took place. Almost four years elapsed between this event and the Boston Tea Party (*q.v.*). Actual armed rebellion began in 1775, and in March 1776 the British, under Sir William Howe, evacuated the town. The district known as Charlestown, which became a part of Boston proper in 1873, was the scene of some skirmishes in the Revolutionary War, and there an obelisk-shaped monument was dedicated in 1843 to commemorate the Battle of Bunker Hill (1775).

Bostonians very strongly sympathized with the abolitionist movement, and William Lloyd Garrison's paper *The Liberator* began publication here as early as 1831. During the next decades, there was a shift in religious belief from Trinitarianism to Unitarianism, and the stamp of the latter form of Congregationalism lies on 19th-century Boston. The First Church of Christ, Scientist, was established here in 1879. The city (together with Cambridge) was in that period the Athens of America, and in or near it resided Hawthorne, Emerson, Whittier, Lowell, O. W. Holmes, R. H. Dana, Longfellow, Prescott, Motley, Bancroft, and Parkman. This intellectual

VIEW OF BOSTON, ACROSS THE CHARLES RIVER, FROM CAMBRIDGE

Courtesy Boston Convention and Visitors Bureau



eminence continued till about 1910. At the turn of the century, William James, Royce, Santayana, and Charles W. Eliot flourished.

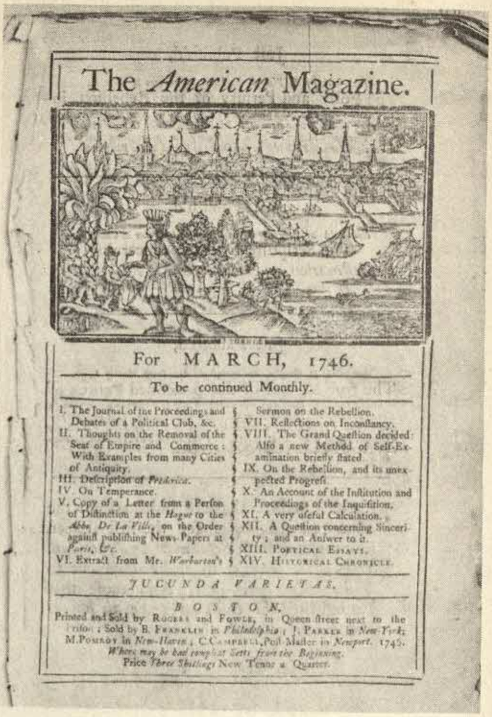
In the 19th century also took place a large-scale immigration which changed the predominantly Anglo-Scottish character of the earlier city to a considerable degree. The Irish famine of 1847 led many Irishmen to settle here, and later arrivals of Irish, Italian, Greek, and Jewish immigrants have much modified the old Puritanism.

Since the beginning of the 20th century, Boston has lost much of the pre-eminence it held in earlier days in the economy of the nation, but it has continued to be a scientific and cultural metropolis. The Boston Symphony Orchestra (*q.v.*), for instance, is known all over the world, and the Massachusetts General Hospital, the Peter Bent Brigham Hospital, and the Leahy Clinic are famous in the field of medical treatment and research.

The recent construction of redevelopment projects, including public housing, downtown office buildings, and institutional structures, was accompanied by the building of new roads to improve access to the city.

The population rose from 18,320 in 1790 to 177,840 in 1860, and to 560,892 in 1900, but Boston experienced its largest increase between 1895 and 1915, when the population rose by 50.01 per cent. In 1950 the population was 801,444; in 1960, 697,197, a drop of 13 per cent.

Boston Fern, a variety of a species native to Florida and the West Indies, commonly cultivated indoors. The leaves are 2 or 3 ft. long and are divided into many narrow segments, which in the numerous varieties are divided and redivided, frilled, or crested in many ornamental ways. It will stand indoor conditions—and even neglect—as no other fern will.



The *American* Magazine.

For MARCH, 1746.

To be continued Monthly.

I. The Journal of the Proceedings and Debates of a Political Club, &c.
II. Thoughts on the Removal of the Seat of Empire and Commerce: With Examples from many Cities of Antiquity.
III. Deſcription of *Frederica*.
IV. On Temperance.
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XIII. POETICAL ESSAYS.
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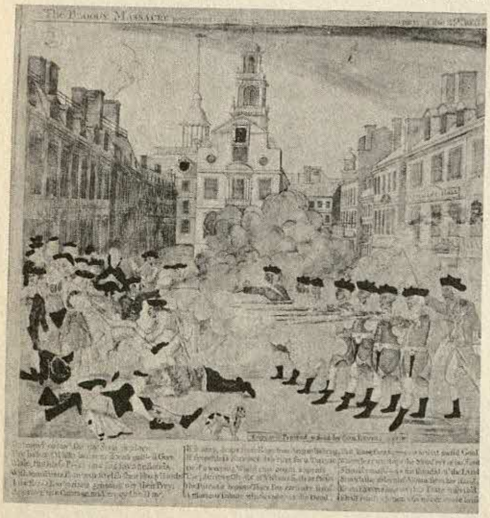
BOSTON IN THE 18TH CENTURY

A page from *The American Magazine*

BOSTON MASSACRE. ENGRAVING BY PAUL REVERE

Courtesy Metropolitan Museum of Art, N. Y.



Boston Ivy, a vine related to Virginia creeper, from which it differs in its three-lobed or three-divided leaves. It is a native of China and Japan and is now widely cultivated in the U.S. Its glossy foliage stands dust and smoke well and assumes brilliant colors in the fall. It climbs high, clinging by adhesive discs at the ends of tendrils.

Boston Massacre (*măs′ȧ-kẽr*), a near riot at Boston, Mass., on March 5, 1770, involving seven British soldiers under Capt. Preston and a mob of citizens. Several minor riots had taken place from time to time, owing to opposition by the people of Boston to the stationing of troops in the city. This incident occurred on State Street, formerly King Street, where the soldiers were attacked with various missiles. A soldier who received a blow fired, and his companions, mistaking an order, followed in shooting at the mob. Several of the populace were killed and seven were wounded. The mob retreated and the bells of the city rang an alarm, causing several thousand people to gather, but no further hostilities took place. Several of the soldiers were tried on a charge of murder, but were acquitted. This incident did much to create a sentiment in favor of treating the colonists with consideration, and the garrison was removed to Castle Island.

Boston Museum of Fine Arts, THE, the first incorporated museum of art in the U.S., February 1870. It was organized by public subscription and various gifts. Located on Huntington Ave. since 1909, the museum houses famous collections and departments including those on Asiatic, ancient Near Eastern, and Egyptian art. The Classical department houses Greek and Roman art. The gallery has an extensive collection of old and present-day masters, both European and American. It also maintains a department of prints and drawings and a textile department. The M. and M. Karolik Collection contains 18th-century American works. The museum operates a school of art and presents lectures, concerts, and other community programs.

Boston Post Road, name of a major highway forming part of U.S. highway No. 1 and the Atlantic highway, extending 235 m. from New York to Boston. Originated as the Old Post Road of colonial times, it passes through many scenic and historic places, including Bridgeport, New Haven, New London, and Providence.

Boston Symphony Orchestra, a concert ensemble, founded in 1881 by Henry Lee Higginson, a Boston banker, who sought to establish a permanent orchestra of the highest standards. On his retirement in 1918, it was incorporated. Its principal conductors have been Wilhelm Gericke (1884-89, 1898-1906), Arthur Nikisch (1889-93), and Karl Muck (1906-08). Pierre Monteux was the conductor in 1919-24 and Serge Koussevitzky, in 1924-49; Charles Munch became the latter's successor. The winter season of the orchestra consists of 30 weeks; the Pops, free open-air Esplanade, and Berkshire Symphonic Festival concerts, together with the Berkshire music center at Tanglewood (see *Stockbridge*), increase the orchestra's season to 48 weeks.

Boston Tea Party, a popular name for an occurrence in Boston Harbor on Dec. 16, 1773. The American colonies had protested to Parliament against placing a tax on articles imported, and the American merchants entered into an agreement not to import from Great Britain while such a tax was collected. However, that body declared its right to tax the colonists without their consent, and, when the English East India Co. sent cargoes of tea to the port of Boston, the Americans resisted the collection of the duty. A conference was held in the Old South Meeting House, after which 60 men, disguised as Indians, boarded the vessels in the harbor and threw 342 chests of tea into the water. To retaliate, the government closed the port against all commerce and navigation.

Boston Terrier, a breed of nonsporting dog, named after the city of its origin. It was produced about 1890 by crossing a bulldog with a white English terrier. Compactly built, it has a wide chest, short square head, straight legs, and eyes set wide apart. The desirable color pattern is brindle with white muzzle, collar, breast and forelegs. Three weight classifications are recognized: light, under 15 lb.; medium, 15-20 lb.; heavy, 20-25 lb.

Boston University, a Methodist-founded, nonsectarian, coeducational, and privately endowed institution of higher learning, situated on the banks of the Charles River in Boston, Mass. Founded in 1839, it was chartered in 1869. The university consists of the schools of theology, law, medicine, education, social work, fine and applied arts, nursing, public relations and communications, and the graduate school. There are also colleges of liberal arts, business administration, general education, industrial technology, a junior college, and the Sargent Coll. of Physical Education (for women). The university also maintains an evening division and a summer term. Total student enrollment is about 26,000; and the faculty numbers almost 1,600. The university's libraries contain about 500,000 volumes and many noted collections. The value of the physical plant is $32,000,000.

Bostwick (*bŏst′wĭk*), ARTHUR ELMORE, writer and librarian, born in Litchfield, Conn., March 8, 1860; died in St. Louis, Mo., Feb. 13, 1942. He was educated at Yale Univ., taught for a while, and at various times edited Appleton's "Cyclopædia of American Biography," Appleton's "Annual Cyclopædia," and the "Standard Dictionary." After 1891 he was science editor of *The Literary Digest.*

Bostwick was chief librarian of the New York Free Circulating Library, 1895-99, and head of the Brooklyn Public Library, 1899-1901. He was chief of the circulation department of the New York Public Library, 1901-09. He was president of the American Library Assn., 1907-08, and chief librarian of the St. Louis Public Library, 1909-38. He wrote many books on library science and "Life with Men and Books" (1939).

Boswell (*bŏz′wĕl*), JAMES, biographer, born in Edinburgh, Scotland, Oct. 29, 1740; died in London, England, May 19, 1795. He was the son of Alexander Boswell, one of the Scotch law lords. His father wanted young Boswell to practice law, and he reluctantly studied and qualified for the bar and, eventually, even practised a little. But his heart was not in it. He loved to travel and share the company of distinguished men and women, particularly the company of authors. He made the acquaintance of Voltaire, Rousseau, the notorious John Wilkes, and the Corsican patriot Paoli. And, in particular, he attached himself to Dr. Samuel Johnson (*q.v.*), the moralist, lexicographer, and talker. In 1773 he persuaded Johnson to tour the Hebrides with him and kept a record of their experiences and daily conversation, "The Journal of a Tour to the Hebrides with Samuel Johnson, L.L.D." This was published in 1786, two years after Johnson's death. Five years later he published his "Life of Samuel Johnson" which remains the world's greatest biography (*q.v.*). It remains such not from the greatness of the subject—though Johnson was a great man—but from the skill of its construction, from the manner in which it presents the "living" man, carries conviction, and conveys the actual experience of sharing Johnson's company.

Boswell's personal life, especially after the death of Johnson, was not a happy one. In 1787 his devoted and long-suffering wife died, and he sank into sad excesses. The discovery, in this century, of immense collections of Boswell's private papers has made him a figure of even greater literary and historical importance.

JAMES BOSWELL

Bosworth (*bŏz′wûrth*), a small town (population, 1,150) of Leicestershire, England, noted for the Battle of Bosworth Field, on Aug. 22, 1485, in which the Earl of Richmond, afterward Henry VII, defeated Richard III, thus ending the Wars of the Roses.

Botany (*bŏt′ȧ-nў*), the science that treats of plants, their structure, description, and classification, the functions of their parts, and the environmental conditions governing their growth and reproduction. The three kingdoms of nature are usually designated as *mineral, animal* and *vegetable,* and of these only the last two are living. Plants compose the *vegetable* kingdom and in the more highly developed species are markedly different from animals in form and structure. There are three main characteristics by which animals differ from plants. These consist of differences in type of food, the ability to move some or all of their parts, and the power of volition or will. Plants take in air, water, and dissolved minerals through their leaves and roots, and from these elements they manufacture their own food in the presence of light. Animals are incapable of making their food and must feed upon plants or other animals. The principal uses of plants are for animal food, drugs for protection, for decoration, and to preserve the fertility of the soil and maintain the proper balance of oxygen and carbon dioxide in the atmosphere. The elements necessary for plant growth are light, heat, water, and dissolved minerals, and since the requisite amount of these varies with different kinds of plants, a flora peculiarly adapted to local conditions occurs in every climatic zone. Plants are propagated by seeds, spores, or particles of the main stock.

Botany treats of plants as wholes and also as consisting of various organs. The organs of vegetation are the roots, stems and leaves, and the flowers bear the organs of reproduction. The roots grow downward and absorb water and mineral elements from the soil. They commonly divide into many small branches called rootlets. The part which grows upward and bears the leaves and blossoms is called the stem. It usually bears many branches and branchlets, each having leaves in various proportions, but in some species leaves are lacking. The leaves contain the green pigment known as chlorophyll (*q.v.*) which gives them their green to brownish color. They grow mostly on the branches of the stem and are of different sizes and forms, with one side toward the sky and the other toward the ground. The foliage of plants is composed of leaves. See *Plants.*

Classification. The classification is now based on the particular species of plants and their principal affinities. By species is meant an assemblage of individual plants having characteristics in common, coming from the same original stock, and having seeds or spores that produce similar individual plants. The view is held that species of the same kind, through long periods of time and under vastly different conditions, may undergo gradual variations and eventually become new and different species. The study of botany is now generally confined to the affinity of plants of the same and different regions; to the cells and tissues by means of the microscope; to the growth and development of new species from different kinds; and to the relation of plants to their environments. The principal divisions of botany now are: *Anatomy* and *morphology,* dealing with plant structure; *physiology,* treating of the functions and vital actions of plants; *taxonomy* or systematics, relating to classification and arrangement of plants into orders, families, and genera; *paleobotany,* dealing with fossil plants; *ecology,* treating of plants in relation to their environments; *mycology,* relating to fungi; *phytopathology,* dealing with plant disease; *cytology,* treating of the structure and reproduction of individual cells; and *genetics,* dealing with the transmission of hereditary characteristics and plant breeding. *Phanerogamic* botany treats of flowering plants, and *cryptogamic botany* of flowerless plants.

HISTORY. The study of botany as a pure science is not as old as astronomy or geography, but the study of economic botany began with the establishment of agriculture by primitive man about 8,000 to 10,000 years ago. Before the dawn of written history, primitive man had discovered, improved and learned to utilize all basic crop plants now in use; he knew the value of crop rotation, the use of legumes as fertilizers, the necessity of pollination for setting of fruit, and many of the principal plant diseases. Modern man has merely improved the plants and animals discovered and domesticated by primitive man. The first written work on botany dates from Theophrastus, a pupil of Aristotle, who lived in the 4th century B.C. His work is largely a compilation of the knowledge in existence at that time, and, although his classification of plants is unsatisfactory, he showed greater skill in the description of plant organs than scholars who lived in the centuries immediately following his time. In the 1st century A.D., Dioscorides, of Asia Minor, described about 600 plants in a work that was considered good authority until the revival of learning. About the same time, Pliny the Elder described more than 1,000 species of plants. His work contains numerous errors and bears evidence of having been compiled from various sources, rather than written from personal investigation.

The Arabians gave much attention to this science in the 8th century, but material progress was not made until the 13th to the 16th centuries when the German herbalists, Magnus, Bock, and Brunfels and others began to describe and classify plants principally for their medicinal properties. Serious study of botany thus began in relation to medicine, and, with the advent of printing, botanical knowledge became widespread. In the 16th century, Otto Brunfels published an extended work in two volumes with able descriptions and cuts, under the title, "History of the Plants of Strasburg." The store of knowledge was greatly extended by other German, Dutch, Italian, and French writers. Before the end of the century, the principal universities of Europe established chairs of botany and organized botanical gardens. During the period of colonial expansion of the English, Dutch, Spanish, French, and Portuguese in the 17th and 18th centuries, many scholars and collectors traveled throughout the unknown parts of both hemispheres for the study of plant life.

Linnaeus (*q.v.*), a Swedish naturalist, prepared and published a classification of plants in 1735 which was speedily adopted in place of those formerly used and served the purpose of study for many years. He established the present-day binominal system of nomenclature and his system of classification is based largely on the characteristics and production of flowers and seeds. It was superseded by the system of a French scholar, Bernard Jussieu (1699-1777), which is founded on the natural affinities of plants and is the basis of the classifications that are generally approved. Jussieu devoted much time to the culture of plants in gardens, took personal observations of their growth, and lectured extensively in the leading universities of Europe. He taught his system of classification at Montpelier as professor of botany and later at Geneva. He described his system in his "Elementary Principles of Botany," published in 1804.

In the latter half of the 17th century the microscope opened a new epoch in the discovery of the plant cell by Robert Hooke (1665). This led to the study of the minute structures of the plant, to the development of plant anatomy, morphology, and histology by Grew and Malpighi (1670-75), and finally culminated in the promulgation of the cell theory in the first half of the 19th century. The concept that the cell is the ultimate unit of structure of plants stimulated intensive study of the cell and eventually led to the development of cytology and the discovery of the cell organs which govern the transmission of hereditary characteristics. Thus, by the end of the 19th century botany had become fully established as an inductive science.

Botany Bay, an inlet 5 m. s. of Sydney, on the east coast of Australia. It was discovered in 1770 by Capt. Cook, and so named on account of the large number of formerly unknown plants found there. The first English penal colony was founded at Botany Bay in 1788, and later it was removed to Port Jackson, near the site of Sydney. It was long known as Botany Bay Settlement. A monument was erected on the place where Capt. Cook landed.

Botetourt (*bŏt'ę-tōōrt*), NORBORNE BERKELEY, administrator, born in England about 1734; died Oct. 15, 1770. He became a peer in 1764, and four years later was made governor of Virginia. In 1769 the colonists protested against taxation and sending accused persons to England for trial, and he dissolved the legislature which passed resolutions against the taxation laws. After failing to effect a conciliation, he demanded his recall and this the government granted.

Botfly (*bŏt'flī*), a large, yellowish fly, parasitic in its early stages upon certain animals. The fully developed fly is more than a half inch in length, and the female has an extensile abdomen. They lay their eggs upon the hair of the horse, which the animal removes to the stomach by the tongue. There they are hatched and the larvae hang to the coats of the stomach, where they remain about a year, when they are discharged with the excrement, and after a brief time become perfect flies. The bots are very injurious to the horse, when a large number infest the stomach. Botflies are troublesome to sheep, cattle, and wild animals.

Botha (*bō'tȧ*), LOUIS, soldier and statesman, born at Greytown, Natal, in 1864. He spent his early life on a farm in the Vryheid district, where he engaged in sheep and cattle raising, and later became a prominent member of the *volksraad* at Pretoria. At the beginning of the Anglo-Boer War, in 1898, he was given an important command, and distinguished himself at Colenso and Spion Kop. In 1900 he was commander-in-chief of the Boer forces. After the war he supported the Boer-British coalition party, and in 1907 was made premier of the Union of South Africa. In 1915 he headed the British invasion of German Southwest Africa. He died Aug. 28, 1919.

Bothnia (*bŏth'nĭ-ȧ*), GULF OF, the northern extension of the Baltic Sea, between Sweden on the west and Finland on the east. It is about 430 m. long, 85 to 135 m. wide, and from 100 to 130 ft. deep. The water is but slightly salty, owing to the inflow of numerous rivers and the limited evaporation due to its location in a cold region. It contains a number of good harbors and is the seat of much activity in the summer season for lumber, mineral, and fish exports by water navigation. In the winter it is frozen over and is crossed on the ice.

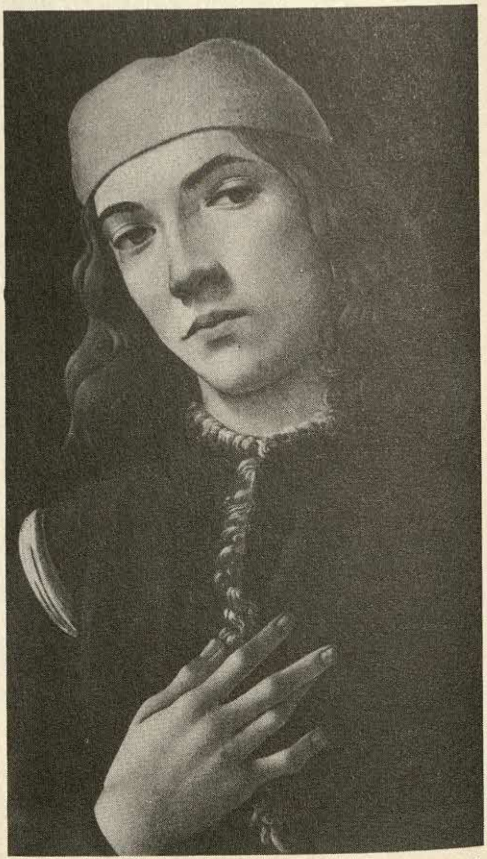
Bothwell (*bŏth'wĕl*), JAMES HEPBURN, EARL, known for his marriage to Mary, Queen of Scots, born in 1536; died in 1578. In 1557 he occupied an influential position in Parliament. The murder of Queen Mary's husband, Darnley, was thought to have been committed by him. He was tried, but acquitted when he appeared at court with 4,000 sympathizers. He divorced his own wife and forcibly carried Queen Mary a prisoner to Dunbar Castle, where he required her to marry him, having previously been created Duke of Orkney. The nation was aroused with indignation. Mary was imprisoned at Edinburgh and he fled to Malmo, on the coast of Sweden, where he died.

Bo Tree (*bō trē*), or PIPAL, the sacred fig tree of India and Ceylon. Trees of this kind are planted by the Buddhists near their temples. They yield a small edible fig, which is of little value, but the sap yields caoutchouc and the lac insect makes the tree its abode. At Anarajapura, in Ceylon, is a famous bo tree that was planted about 288 B.C. It is venerated by the Buddhists, since it is said that Vishnu was born under this tree.

Botta (*bô-tȧ'*), PAUL ÉMILE, traveler, born in Turin, Italy, Dec. 2, 1802; died Mar. 29, 1870. He went to Egypt in 1830 as a physician of Mehmet Ali, and subsequently became French consul in Alexandria. In 1843, he made excavations near the Tigris for monuments of Assyria and there discovered the palace of Sargon, King of Assyria.

Böttger (*bẽt'gẽr*) or BÖTTIGER, JOHANN FRIEDRICH, inventor, born in Schleiz, Thuringia, Feb. 4, 1682; died in Dresden, Saxony, March 13, 1719. Originally an apothecary, he located deposits of a clay known as kaolin and originated the process by which Dresden porcelain or china is made. His efforts were sponsored by the elector of Saxony, who established a porcelain factory at Meissen, with Böttger at its head. See also *Pottery*.

Botticelli (*bŏt-tê-chĕl'lê*), ALESSANDRO FILIPEPI, painter, born in Florence, Italy, in 1447; died in 1510. His name originally was Alessandro Filipepi, but he took the name Sandro Botticelli from his first master, a goldsmith. Subsequently he studied painting under Fra Lippo Lippi, a Carmelite monk, and from him acquired an early style much admired. About 1485 he finished his "Birth of Venus," now in Florence, which is one of his many pictures hanging in the leading galleries



Courtesy National Gallery of Art, Wash., D. C.

PORTRAIT OF A YOUTH. PAINTING BY BOTTICELLI

Courtesy Metropolitan Museum of Art, N. Y.

BIRTH AND TRIUMPH OF VENUS. PAINTING BY FRANÇOIS BOUCHER

of Europe. He later became a disciple of Savonarola. His chief works include: "Adoration of the Three Kings," "The Triumph of Spring," "The Nativity," and "Virgin With the Child and St. John."

Bottle (*bŏt'tl*), a vessel with a small neck, usually made of glass, and used to contain liquids. In ancient times bottles were made of leather, especially by the Egyptians and Greeks, and bottles of this class are still used in Spain, Sicily, Africa, and the East. Glass bottles have been found in the ruins of Pompeii similar to those in common use at present. They are manufactured by a process of glass molding. The small bottles are made of flint glass and the large ones of a cheaper grade of glass. In manufacturing a blowtube is used, and the molten material is placed in an iron mold.

Boucher (*bōō-shā'*), FRANÇOIS, painter, born in Paris, Sept. 29, 1703; died there May 30, 1770. A pupil of the painter François Lemoyne and the engraver J. F. Cars, he lived in Italy from 1725 to 1731. He then settled in Paris, where he was soon successfully established as a portraitist in the highest circles of society. Well acquainted with the powerful Mme. de Pompadour, whom he portrayed, he was appointed inspector of the Gobelin tapestry manufactory, and also court painter and director of the academy. In addition to his portraits, he painted various subjects popular at the time, such as mythological themes, children, shepherds, etc. With Watteau and Fragonard, he is considered one of the great masters of French Rococo. His works include: "Venus in the Smithy of Vulcan," "Diana After the Bath," "Rape of Europa," and "Leda." The Frick Gallery in New York has a remarkable collection of his paintings.

Boucicault (*bōō'sĭ-ķôlt*), DION, author and actor, born in Dublin, Ireland, Dec. 26, 1822; died Sept. 18, 1890. He studied at Univ. Coll., London, and took up the work of an architect, but soon gave it up for dramatic work. In 1841 he completed his "London Assurance," written in conjunction with John Brougham, and it was dramatized and acted successfully at Covent Garden. He became an actor in 1852, and the following year toured America, remaining until 1860, when he returned to London. He opened a theater in London in 1862, but the venture did not prove successful, and after 1876 he resided in New York City. As a playwright he was very prolific and produced about 300 pieces of different kinds, mostly dramatic. Among his best works are: "Louis XI," "Old Heads and Young Hearts," "Corsican Brothers," "The Streets of London," "The Irish Heiress," "Flying Scud," and "The Shaughraun."

Boudreau (*bōō-drō'*), LOUIS, baseball player and team manager, born in Harvey, Ill., July 17, 1917. Boudreau attended the Univ. of Illinois, and the year before his graduation (1938) signed a contract to play with the Cleveland Indians as shortstop. He was sent to Buffalo, N. Y., to play in the International League, but a year later was called back to the Cleveland Indians where he soon established a reputation as an outstanding shortstop. At the end of the 1941 season, Boudreau was made manager of the Indians, becoming the youngest manager in American League history, and signed a contract as manager of the club the following year. He broke another record in 1944 when, as winner of the American League batting crown, he became the first man in 44 years to win that title while operating as full-time manager of his team. In 1948 the Baseball Writers Assn. of America voted Boudreau the most valuable player of that year in the American League.

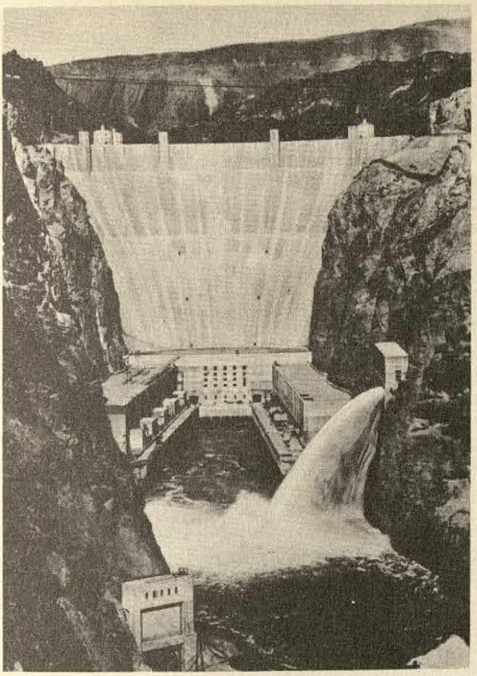
Bougainville (*bōō-găn-vēl'*), the largest of the Solomon Islands, in the Western Pacific, 180 m. long and 30 m. wide. Most of the area is covered by a densely forested mountain range known in the north as Crown Prince Range and in the south as Emperor Range. The highest peak, Mt. Balbi, is 10,171 ft. high and volcanic. The volcanic soil of the region produces coconuts, maize, rice, coffee, and copra, and gold and oil are found. Bougainville has excellent harbors, the best of them being Kieta, Tonolai, and Buka Passage. The interior has not been altogether explored, but a good highway (40 m.) runs along the coast. The native population comprises many language groups all of whom use pidgin English as their linking language. These natives are known as ferocious fighters and are in some instances cannibalistic. Their chief occupation is agriculture.

HISTORY. The island was discovered in 1768 by Louis Antoine de Bougainville, a French navigator. It was annexed by Germany (1900) in the settlement of Pacific territorial claims by the U.S., Germany, and Britain, remaining under German domination until World War I when it was taken by an Australian force. The League of Nations mandated the territory to Australia in 1920, and a civil Australian island government was established in 1921, Bougainville being only a part of the Territory of New Guinea. In 1942 the Japanese took Bougainville, establishing a base at Buin and an airfield at Kahili, but by June 1944 the island had been reconquered by Americans and Australians and had reverted to its prewar status. See *World War II*.

Bougainville, LOUIS ANTOINE DE, French navigator, born in Paris, France, in 1729; died there Aug. 31, 1814. After taking a course of instruction in law, he entered the army, and in 1756 was dispatched to Canada as aide-de-camp to Gen. Montcalm. He served in the Seven Years' War (1761-63), and then commanded an expedition to the Falkland Islands with the view of effecting colonization. In 1766 he set sail on a tour to circumnavigate the globe, by which he materially enriched geography, and returned to Nantes in 1769. Napoleon I conferred upon him the badge of the Legion of Honor, and made him a senator and count of the empire.

Boulanger (*bōō-län-zhā'*), GEORGES ERNEST JEAN MARIE, general and politician, born in Rennes, France, April 29, 1837; died in Brussels, Belgium, Sept. 30, 1891. A graduate of St.-Cyr, he served with distinction in North Africa and Indo-China and in the Franco-Prussian War. Recalled from command (1884-85) of the Tunis occupation, he was war minister in 1886-87. A popular hero for his support of nationalist demands for revenge against Germany, he added color to his reputation with public appearances on horseback. Dropped from the cabinet and the army, with antirepublican extremist backing he won election (1888, 1889) to the chamber of deputies, promising constitutional revision. Fearing a *coup d'état,* the government prepared charges against him, and he fled from France in April 1889. Convicted of conspiracy and exiled, he committed suicide.

Boulder (*bōl'dēr*), a city in Colorado, county seat of Boulder County, located 29 m. N.W. of Denver, on the Union Pacific and Colorado and Southern R.R.'s. Although it is best known as a tourist and vacation center, because of its healthful climate and scenic location, Boulder is also a supply center for the mining and agricultural area which surrounds it. It is the seat of the Univ. of Colorado. Boulder is the only known city to own a glacier, the Arapaho, source of the municipal water supply. The city was incorporated in 1871. Population, 1950, 19,999.



Courtesy Allis-Chalmers Mfg. Co.

BOULDER DAM—RENAMED HOOVER DAM IN 1947

Photo taken in 1936, during construction

Boulder, a large rock found at a distance from the formation to which it belongs. The term *erratic boulder* is generally applied to rocks found lying detached on the surface, and *boulder clay* is used to describe the glacial drift, usually a compact blue or red clay, in which the boulders are found. These formations belong to the early quaternary times and are widely distributed. Boulder clay has been traced over vast regions of British America and the northern part of the U.S. In Scotland it is known as *till.* Boulders belonging to the rocks of the Scandinavian peninsula are scattered over the plains of Denmark and northern Germany. Rocks of this class, deposited from icebergs and glaciers, are abundant in North and South Dakota.

Boulder Dam, the vast government dam, authorized by Congress, in 1928, in the Colorado River, located about 40 m. from Las Vegas, Nev. The height surpasses 700 ft. and the authorized cost was $165,000,000. It is designed for power, irrigation, and the protection of the lower Colorado River Basin against overflows. Active construction work was done between 1933 and 1937. Originally (1930) named Hoover Dam after Herbert Hoover, then President, it was named Boulder Dam in 1933, but was renamed Hoover Dam in 1947.

Boulogne-sur-Mer (*bo͞o-lôn'y'-sür-mâr*), a seaport city of France, at the mouth of the Lianoe River, on the Strait of Dover, about 20 m. s.w. of Calais. The city is divided into the older and the newer parts, or the old and new districts, and has a castle which dates from 1231. It has vast commercial interests, owing to its fine harbor, extensive wharves, and excellent steamship and railroad facilities. Population, *ca.* 70,000.

Boulogne-sur-Seine (*-sän*), a town of France, in the department of Seine, 5 m. w. of Paris. On the Seine River, it is a suburb of Paris, with which it is connected by a fine stone bridge. The celebrated park and promenade in Paris, Bois de Boulogne, was named from this town. Population, *ca.* 60,000.

Bounty (*boun'tĭ*), in economics, a premium paid by the government to the producers, exporters, or importers of certain articles. This is done to aid in fostering a new enterprise during its infancy, or protecting one long established, owing to its special benefit to the country. In 1890 the Congress of the U.S. authorized the payment of a premium to producers of sorghum, cane, and beet sugar by way of a bounty. This was done with the view of eventually increasing the production of sugar to equal the annual consumption. By reason of this encouragement large investments were made in sugar-producing interests and the production has been correspondingly increased. The term is applied to a government grant made to induce enlistments in the army, as at the time of the American Civil War, when from $50 to $900 was paid as an inducement for men to enter the service. Men serving in the British army in India receive a bounty as an inducement to extend the time of service.

Bounty Jumpers (*boun'tĭ jŭmp'ẽrz*), a term applied during the Civil War to persons who volunteered to secure a bounty and then deserted to enlist again in some other locality, under a different name, in order to secure another bounty. The government applied a severe penalty, but a number of persons took great risks, owing to the high sums of the bounty.

Bourbon (*bo͝or'bŭn*), a highly celebrated French family which has furnished a large number of celebrated kings, statesmen, and warriors. It dates back to the 10th century, and still has descendants who are important in several states of Europe. From it descended the Bourbons of France, Spain, and Naples. It derived its name from the *Bourbon,* a castle and state of central France, now the department of Allier. The family was first known in history through Adhemar, who was lord of the state, and whose family increased in power and territorial possessions until, in 1272, Beatrix, a daughter of John of Burgundy and Agnes of Bourbon, married Robert, a son of Louis IX of France, and thus connected the Bourbons with the Capets. The first king of France of the Bourbon family was the famous Henry of Navarre, who became Henry IV in 1589. His descendants reigned continuously until 1792, and again after the fall of Napoleon, from 1815 to 1848. The kings of the French royal line of the House of Bourbon are in this order: Henry IV, Louis XIII, XIV, XV, XVI, XVIII, and Charles X. The House of Orleans, a branch of this family through Philip of Orleans, brother of Louis XIV, was raised to the throne of France by the revolution of 1830, but lost it by the revolution of 1848. The present head of the French House of Bourbon is the Count of Paris, an Orleanist.

The Spanish-Bourbon branch of the House of Bourbon originated in 1700, when Louis XIV placed the Duke of Anjou, who was his grandson Philip, on the Spanish throne as Philip V of Spain. This dynasty reigned consecutively until 1868, when Queen Isabella was dethroned, but regained the crown in 1874. The last occupant of the Spanish throne, Alfonso XIII, born in 1886, was a descendant of Philip V. The Neapolitan branch of the Bourbon family was founded through the Duke of Anjou, and ruled in Naples until that state became a part of Italy in 1860. Another branch ruled in Parma and Piacenza the greater part of the time from 1748 until the two states became annexed to the kingdom of Italy.

Bourbon, CHARLES, Duke of Bourbonnais, styled Constable de Bourbon, born Feb. 17, 1489; died May 5, 1527. He was the only heir of the Count of Montpensier. By marriage with the only daughter of the Duke of Bourbon, he united the vast estates of the two branches of the Bourbon family. His high rank in birth and wealth, his brilliancy in arms, and rigid morals soon caused him to hold a high position in the government of France. At the age of 26 years he was given the constable's sword by Francis I, and was appointed to lead an army into Italy. He disciplined the army, crossed the Alps in 1515, and won a decisive battle at Marignano. By his successes he soon gained the reputation of being the greatest general of his time, and was made governor of Milan. Owing to complications with Maria Louise, mother of the king, his estates were seized. Accordingly, he renounced the interests of France and formed an alliance with Charles V of Spain and Henry VII of England. He gathered an army of 6,000 German lancers and united them with Spanish troops, and fought in the Battle of Pavia, Feb. 24, 1525, in which the French army was defeated and Francis I taken prisoner. He now became Duke of Milan and commander of a Spanish army in Italy. In 1527 he attempted to seize Rome, but was killed by a bullet fired at him by Benvenuto Cellini, the Italian artist. He was highly respected by his soldiers, who carried his body to Gaeta and erected a monument to his memory.

Bourgeois (*bōōr-zhwä′*), LÉON VICTOR AUGUSTE, statesman, born in Paris, France, May 21, 1851; died Sept. 29, 1925. His political career began with his appointment as undersecretary of state in 1888. In 1895-96 he was premier. He was elected to the Senate in 1905, becoming its president a short time later. Bourgeois became prominent in peace activities as French delegate to the Peace Conferences at the Hague in 1899-1907. He represented France on the League of Nations and in 1919 was named president of the League Council. Bourgeois had begun writing on peace as early as 1896, when he published "La Solidarité." This book was followed by "L'éducation de la democratie Française," and "Pour la Société des Nations." In 1920, Bourgeois was awarded the Nobel Prize for Peace for his intensive work in the field.

Bourgeoisie (*bōōr′zhwä-zē′*), a French word, derived from "bourgeois" meaning citizen. As a sociological term it comprises the middle class, composed of the smaller independent shop owners, proprietors of mills and plants, and even professionals. It is opposed to "high-class" society, formerly aristocracy, and laborers (proletariat).

Bourges (*bōōrzh*), a city of France, capital of the department of Cher, 135 m. s. of Paris. It is located at the junction of the Auron and Yèvre Rivers, and is the focus of important railroad lines. In the old part the streets are crooked and poorly improved, but the newer section has many fine public and residential buildings. It is the seat of a college, a public library, a normal school, and a magnificent Gothic cathedral, known as the Cathedral of St.-Etienne. The trade is chiefly in wine, cereals, and live stock. Among the manufactures are clothing, leather, wine, and machinery. Julius Caesar captured it in 52 B.C., when it was known as Avaricum. Charles VII of France resided there after Orleans was occupied by the English. Population, 1954, 53,879.

Bourget (*bōōr-zhē′*), PAUL, novelist and essayist, born in Amiens, France, Sept. 2, 1852. His father was a Russian who had settled in France as professor of mathematics at the Lyceum of Clermont-Ferrand, where he studied for some time and afterward attended the Coll. of Ste. Barbe. In 1873 he began to devote his time to literary work, though his active career as a writer began about 10 years later. He gained a reputation as writer and critic, and carried realistic observation into his work. In 1895 he was admitted to the French Acad., and he may be classed in the front rank of novelists and essayists. His chief publications include "Cosmopolis," "Le Disciple," "Outre-Mer," and "Mensonges." He died in 1935.

Bourinot (*bōō-rĭ-nō′*), JOHN GEORGE, historian, born in Sydney, Nova Scotia, Oct. 24, 1837; died Oct. 13, 1902. He attended public schools and Trinity Coll., Toronto, and for many years edited the Halifax *Reporter*. In 1880 he was chosen chief clerk of the House of Commons of the Dominion, and two years later became an official in the Royal Society of Canada. Besides contributing numerous articles to magazines in Canada and England, he published many works relating to government and constitutional law.

Bourke-White (*bûrk'hwīt*), MARGARET. See *White, Margaret Bourke.*

Boutwell (*bout'wĕl*), GEORGE SEWELL, statesman, born in Brookline, Mass., Jan. 28, 1818; died Feb. 27, 1905. He became a merchant at Groton, in which occupation he remained until 1855. During convenient times he read law and entered politics in 1840. He was elected seven times to the Legislature as a Democrat, and was Governor, 1851-52. When the Republican Party was organized, he went over to that organization, and was twice elected to Congress on the Republican ticket. In 1869 he was made Secretary of the Treasury by President Grant, but resigned that position in 1873 to enter the U.S. Senate. He was for six years overseer of Harvard Coll., and wrote many able articles on taxation, finance, and educational topics.

Bow (*bō*), a weapon used in the chase and in war from antiquity, and still employed by savages in warfare and in many countries as a means of amusement. Two forms of the bow are in use, the *longbow* and the *crossbow.* The former is the earlier kind and the more celebrated, having been used as the weapon of archers in the Middle Ages. It passed out of use as a military weapon with the improvement of firearms. The crossbow is now used in some field sports. It is made by attaching a bow to a stock resembling a musket, and discharges a short and stout arrow called a *quarrel.* The longbow is about 5 ft. long, and discharges an arrow 3 ft. long, furnished with a steel head. Wood is used most generally, such as yew, elm, and wych-hazel, though steel and other elastic materials make good bows. The savages usually poison the end of the arrows used in war. See also *Violin.*

Bowditch (*bou'dĭch*), NATHANIEL, self-educated American astronomer and mathematician; born at Salem, Mass., Mar 17, 1773; died in 1838. He left school at the age of 10 to help in his father's cooper shop. He then became apprenticed in a ship-chandlery where he remained until 1795. He began his study of navigation, astronomy, and mathematics during five sea voyages (1795-1803) and published "The New American Practical Navigator" (1802), an expanded version of a standard English work. As president of a Salem life insurance company (1804-23), and actuary of the Massachusetts Hospital Life Insurance Co., he continued his studies of astronomy, translating with notations the first four volumes of Laplace's *"Mécanique Céleste,"* published in installments from 1829 to 1838.

Bowdoin (*bō̆'d'n*), JAMES, statesman and author, born in Boston, Mass., Aug. 8, 1727; died Nov. 6, 1790. He was a graduate of Harvard and a man of profound learning. In a correspondence he suggested that the phosphorescence of the sea is due to the presence of minute animalculae, a theory now generally accepted. He carried on a correspondence with Benjamin Franklin, who read many of his letters before the Royal Society of London, under whose direction they were published. He was president of the Massachusetts Constitutional Convention, and was elected governor of the state in 1785. Bowdoin Coll. was named in his honor. His son, James Bowdoin, Jr., born in Massachusetts, Sept. 22, 1752, died Oct. 11, 1811, was educated at Harvard and Oxford, England, and became a noted writer and public man. He was sent as minister to Spain in 1804 and served in other official capacities.

Bowell (*bou'ĕl*), SIR MACKENZIE, statesman, born in Suffolkshire, England, Dec. 15, 1823. He came to Canada at the age of 10 years and settled at Belleville, Ontario, where he became editor and proprietor of *The Intelligencer.* This newspaper exercised a wide influence politically as a conservative organ. In 1867 he was elected to the Parliament of Canada and became minister of customs in 1878, serving until 1891, when he was made minister of defense. In 1892-94 he was minister of trade and commerce, and subsequently was president of the Privy Council. He was chosen premier in 1896, and was long a leader of the Conservative opposition. He died Dec. 10, 1917.

Bowen (*bō̆'ĕn*), FRANCIS, author and lecturer, born at Charlestown, Mass., Sept. 8, 1811; died Jan. 21, 1890. He studied at Harvard Univ., from which he was graduated in 1833, and was editor of the *North American Review,* 1843-54. In the latter year he became professor of natural religion and moral philosophy at Harvard. He opposed the free trade views of Adam Smith and the philosophical systems of Kant, Fichte, and John Stuart Mill. His writings embrace: "Gleanings from Literary Life," "Resources and Institutions of the American People," "Treatise on Logic," and "Critical Essays on Speculative Philosophy."

Bower Bird (*bou'ē̆r bē̆rd*), the name of certain birds belonging to the bird of paradise family, native to Australia and New Guinea. They were so named from the remarkable bowers or galleries which they construct. In size the different species vary somewhat, but the representative class is about the size of a jackdaw, and the plumage in the males and females is dissimilar, being a satin black in the former and a grayish-green in the latter. The bowers, built of twigs and leaves, are decorated with shells, flowers, bones, feathers, and other conspicuous objects. They are not nests, but places of amusement, and in them the male performs queer antics to attract its mate. Both in architecture and ornamentation, these birds show remarkable skill and taste.

Bowery (*bou'ē̆r-y̆*), THE, a street in New

York, N.Y., extending from Chatham Square to Cooper Square which derived its name from the "Bouwerij," farm of Peter Stuyvesant (1592-1672). The name is often used to designate the area of lower New York adjoining the street, once notorious for lawlessness and poverty. It is now known as a district of cheap shops and rooming houses.

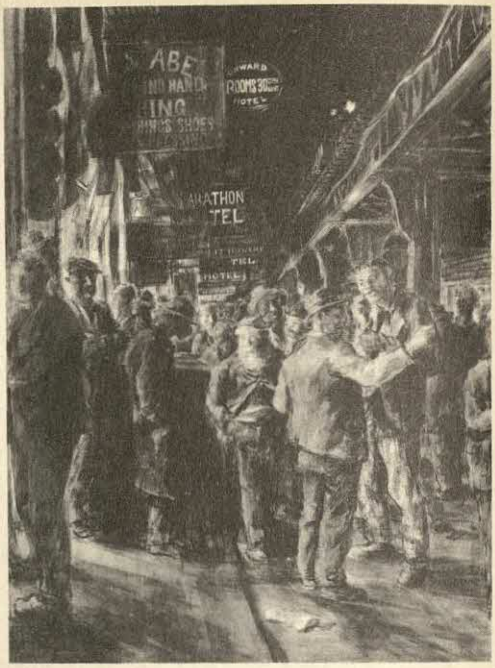
Bowles (*bōlz*), CHESTER, businessman and public official, born in Springfield, Mass., April 5, 1901. He was graduated from Yale Univ. in 1924 and became a reporter on the Springfield *Republican* later that year. He began a highly successful advertising career in 1925 with the George Batten Co.; in 1929 he formed the firm of Benton & Bowles with William Benton. Appointed chairman of the board in 1936, Bowles left the firm in 1941. First Connecticut's rationing administrator, then director of the state office of price administration, he became national price administrator in 1943. After World War II, he opposed the lifting of price controls, and he resigned (July) from the post of director of the Office of Economic Stabilization, to which he had been appointed earlier in 1946. Bowles was governor of Connecticut in 1949-51, ambassador to India and Nepal in 1951-53, and a Democratic Congressman from Connecticut in 1959-60. In 1961 he joined the Kennedy administration first as Under Secretary of State and later as foreign-policy adviser. Bowles published "Ambassador's Report" in 1954. "Africa's Challenge to America" was published in 1956 and "Coming Political Breakthrough" in 1960.

Bowles, WILLIAM LISLE, clergyman and poet, born in King's Sutton, England, Sept. 24, 1762; died in Salisbury, April 7, 1850. His "Fourteen Sonnets" (1789) was praised as a departure from the conventional poetry of the period, and for its fresh, natural quality. He is remembered best, however, as a figure in the "Pope-Bowles controversy," originating in Bowles's 1806 edition of Pope's works, which had a part in early 19th-century literary criticism.

Bowling (*bōl'ĭng*), the American sport of tenpins; also the name applied to many ancient and modern games in which a ball is rolled at symmetrically arranged pins.

Bowling is over 7,000 years old. The Egyptians bowled a ball under an arch at a setup of nine pins over 5,200 years ago. Every race has indulged in some type of bowling, each with its own equipment and rules. There are certain resemblances among them all.

The Dutch brought one form of the sport to New Amsterdam in 1623. It flourished in the Colonies until 1850, when it evolved into an indoor game in which ten pins were used. The game spread rapidly; today more than 16,000,000 persons follow it avidly.



Courtesy The Metropolitan Museum of Art, N. Y.

THE BOWERY

Painting by Reginald Marsh (1898-1954)

The American Bowling Congress governs the sport for men bowlers, the Women's International Bowling Congress for women bowlers.

The game is played on an alley bed, constructed of maple and hard pine boards placed edgewise. An alley bed is 62 ft. 10$\frac{3}{16}$ in. long and may be from 41 to 42 in. wide. It must be level within 40/1000's of an inch.

A ball must not weigh over 16 lbs. and must not be over 27 in. in circumference. Pins are 14 in. high and weigh from 3 lbs. to 3 lbs. 10 oz. They are made of maple.

A game consists of 10 "frames," representing the bowler's efforts to topple 10 pins with one or two balls. If he knocks down 10 pins with his first ball he scores a "strike"; if he clears the alley with two balls he rates a "spare."

The list of bowling champions is too long to give here; each year there are many tournaments, all awarding several titles.

Bowling Green (*bōl'ĭng grēn*), the county seat of Warren County, Kentucky, 65 m. N. of Nashville, on Barren River, and the Louisville & Nashville R.R. The surrounding region is agricultural, producing tobacco, livestock, poultry, and strawberries. The manufactures include flour, clothing, meat, and bakery, tobacco, and dairy products. Western Kentucky State Coll. is located here. The city was incorporated in 1812. Population, 1950, 18,347; in 1960, 28,338.

Bowling Green, a city in Ohio, county seat of Wood County, 23 m. S. of Toledo, on the Baltimore & Ohio and the New York Central Railroads. The chief buildings include the city hall and the county courthouse; Bowling Green State Univ. is located here. The manufactures include cut glass, canned fruits, and machine tools and dies. It has a large trade in grain and farm produce. Bowling Green was settled in 1832 and was incorporated in 1854. Population, 1940, 7,190; in 1950, 12,005.

Bowman (*bō′mạn*), ISAIAH, geographer, educator, and author, born in Waterloo, Ont., Can., Dec. 26, 1878; died in Baltimore, Md., Jan. 6, 1950. A graduate of what is now Eastern Michigan Univ., he received a Ph.D. degree from Yale Univ. in 1909. After teaching in several universities, he became assistant professor of geography at Yale. From 1915 to 1935, he was director of the American Geographical Society. Under his guidance, the society's library and map collection were enlarged, its geographical review developed into one of the world's leading scientific journals, and a map of Hispanic America was prepared on a scale of 1:1,000,000. From 1935 to 1948, he was president of Johns Hopkins Univ. Outside of his strictly academic career, he was prominent as a political geographer. He was chief territorial specialist for the American World War I peace commission; he served on the American delegations to the Dumbarton Oaks and the San Francisco conferences; and he was a top adviser to the U.S. government on various post-World War II problems. Bowman wrote widely, publishing a dozen books; he edited two more, including "Limits of Land Settlement" (1937).

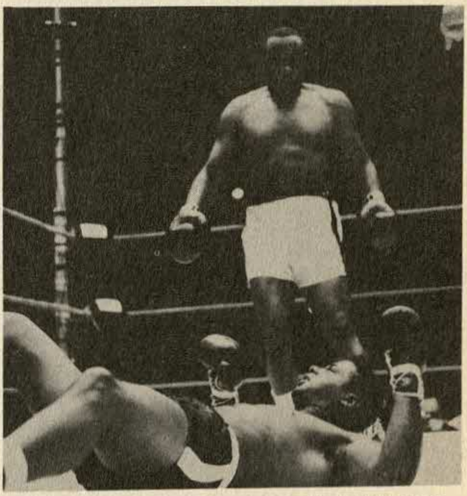
Bow Ware (*bō wâr*). See *Chinaware.*

Box Elder (*bŏḳs′ ĕl-dẽr*). or ASH-LEAVED MAPLE, a small tree of North America, widely distributed in Canada and the U.S. It is planted very extensively as a shade tree and for windbreaks, because of its ability to withstand almost any extremes in climate. It grows rapidly and begins to bear seed in four or five years. The wood is of little value, but is used as fuel where timber is scarce.

Boxer Rebellion (*bŏḳs′ẽr rê-bĕl′yŭn*), the name given the attempt by Chinese patriotic societies, known as "Boxers," or "Righteous Harmony Fists," to drive foreigners out of China. On June 17, 1900, foreigners attempted to protect themselves by seizing the Taku forts at the approaches to Tientsin and Peking. In Peking, foreigners, missionaries, and Chinese Christians were besieged until August 14, when an international force of 18,000 American, Japanese, Russian, British and French sailors and marines entered the city, as Empress Tzu-hsi fled. The Powers did not declare war on China, but in September, 1901, obtained a protocol whereby China agreed to punish guilty officials, send missions of apology abroad, and restrict traffic in arms. China also agreed to pay 450,000,000 taels indemnity from customs revenues over a period of 39 years, to permit fortification of legation quarters and of communications between Peking and the sea, to raze the Taku forts, to suppress anti-foreign agitation and to amend commercial treaties.

See also *China.*

Boxing (*bŏḳs′inḡ*), or PUGILISM, sport in which the contestants spar with each other with or without gloves. Boxing as a sport was practiced by the ancient Greeks, constituting a part of the original Olympic Games. That the sport also flourished in ancient Rome is confirmed by references to it in Virgil's works. Ancient boxing aimed at inflicting as much cruel punishment as possible upon one's opponent, bronze knuckles and rawhide being used as gloves. James Figg, an English pugilist, has been called the father of modern boxing. From 1719-30, Figg fostered the sport, popularizing it and virtually ruling the English boxing world. In the mid-18th century, the boxing glove was invented by Jack Broughton, English boxing champion, 1734-40. The sport became so corrupt, however, that the police were forced to close down the "Prize Ring." This resulted in the introduction of more humane "boxing contests," which were soon being conducted according to rules laid down by the Marquess of Queensbury *ca.* 1867. These rules considerably modified the sport, setting up regulations which, in principle, are still in effect. As boxing gradually lost its popularity in England, it gained in the U.S., and is today one of the most popular sports in this country. Boxing commissions are maintained to regulate the conduct of the sport.



SONNY LISTON KNOCKS OUT FLOYD PATTERSON
The heavyweight title changed hands in a single round in 1962

Modern professional boxing matches are almost always fought between two opponents only, facing each other in a roped-in "ring" 24 ft. square, and sparring with padded gloves not more than five or six ounces in weight. Heavyweight bouts are generally conducted through 15 "rounds" of three minutes each. A committee of two judges and the referee vote on the victor of each round; the boxer taking the greater number of rounds is declared the winner. However, a blow delivered by one opponent which fells the other for a count of 10 seconds or more, automatically determines the contest. The referee is permitted to stop the bout, declaring one opponent the victor, if he believes the other can take no more punishment.

Box Tree (*bŏks trē*), an evergreen tree, from 12 to 15 ft. high, native to Europe and Asia. It was cultivated by the ancient Greeks and Romans as an ornamental shrub in their gardens, and the wood was used for making boxes and ornaments. It is native to England and thrives in the countries bordering on the Mediterranean. The wood is hard, heavy, and yellowish in color, and takes a high polish. Most of the boxwood of commerce comes from the regions adjoining the Caspian and Mediterranean Seas, where it is cultivated.

Boycott (*boi'kŏt*), a concerted refusal to deal with an individual, group, or nation, as an expression of disapproval or method of coercion. The term originated with such an action taken (1880) against Capt. Charles Cunningham Boycott, an English land agent in Ireland, who was ostracized for his ruthless eviction of tenants. The boycott has been used for political purposes and in labor disputes. In the latter, the secondary boycott also was widely used until it was prohibited by the Taft-Hartley Act (1947). In this practice, workers boycott an employer who is involved in a dispute with another group of workers. See also *Embargo*.

Boydell (*boi'dĕl*), JOHN, engraver, born in Dorrington, England, Jan. 19, 1719; died Dec. 1, 1804. He studied engraving in London and promoted the art by patronizing native painters and engravers. These included Reynolds, West, and Opie and from their pictures were made illustrations for the works of Shakespeare. His engravings were combined in one work under the title of "Shakespeare Gallery." In 1790 he was Lord Mayor of London.

Boyer (*boi-yā'*), CHARLES, actor, born in Figeac, France, Aug. 28, 1899. He studied in the Sorbonne in Paris and continued his education at that city's school of drama. He made his debut in *"Les Jardins de Murcie"* (1920). Boyer was a noted French leading man before he made his 1930 film debut in *"La Barcarolle d'Amour."* To U.S. film audiences, however, he was best known in such roles as that of *Pepe le Moko,* the romantic criminal of "Algiers" (1938). After playing many romantic roles in films, he returned to the stage in New York in "Red Gloves" (1948-49), an adaptation of a play by Jean-Paul Sartre. A producer and actor in a television drama series for some years, in 1951-52 he played *Don Juan* in a "concert-reading" touring production of the third act of G.B. Shaw's "Man and Superman," titled "Don Juan in Hell." In 1961 he made his first appearance in a U.S. film as an elderly man in "Fanny."

Boyesen (*boi'ę-sęn*), HJALMAR HJORTH, educator and novelist, born at Frideriksvärn, Norway, Sept. 23, 1848; died Oct. 4, 1895. He graduated from the Univ. of Norway in 1868, and subsequently studied at Leipzig, Germany. Later he came to the U.S. and was editor of *Fredmad,* a Scandinavian journal published in Chicago. His writings are in the English, German, and Norwegian languages. They include "Tales from Two Hemispheres," "Essays on Scandinavian Literature," "Gunnar: A Norse Romance," "Essays on German Literature," "Queen Titania," and "Idylls of Norway."

Boyle (*boil*), KAY, author, born in St. Paul, Minn., Feb. 19, 1903. Much of her childhood was spent in Europe, but her family moved back to Cincinnati, Ohio, at the outbreak of World War I. After study at the Cincinnati Conservatory of Music, she studied architecture (1917-19) at the Ohio Mechanics Inst. She was married in 1923 and went to France. She remained in Europe until 1941, becoming married again in 1931, after she and her first husband were divorced; with her children she lived in the U.S. for most of World War II. Later she returned to Europe with her third husband, an employee of the U.S. State Dept. While they remained in Germany, she wrote on the country for the *New Yorker*. Several stories and a novel, "Generation Without Farewell" (1960), were also set against a German background.

Earlier, she had written novels (the first, "Plagued by the Nightingale," 1930) with varied European backgrounds, poetry, children's books, and many short stories. For her short stories, she received two O. Henry Memorial prizes (1936, 1941). Among her later books are "Thirty Stories" (1946), "His Human Majesty" (1949), and "The Seagull on the Step" (1955).

Boyle, ROBERT, natural philosopher, born at Lismore Castle, Ireland, Jan. 25, 1627; died Dec. 30, 1691. He was the seventh son of 14 children of Richard Boyle, Earl of Cork. He became one of the first members of the "Royal Society of London for Improving Natural Knowledge," which was organized in 1663. At Oxford he demonstrated the elasticity of air by means of an air pump. Boyle's Law, according to which the volume of a gas varies in proportion to the pressure to which it is subjected, was his discovery.

Boyne (*boin*), a river in Ireland, rises in the Bog of Allen, and flows into the Irish Sea, after a course of about 60 m. The adherents of James II and William III fought a battle on its banks in 1690, in which the former were utterly routed and compelled to flee in disorder. The anniversary of this victory, July 12, is still celebrated by Irish Protestants. On the battlefield is a monument 150 ft. high.

Boyne City (*boin cĭt'ȳ*), a city in Charlevoix County, Michigan, on Lake Charlevoix and on the Boyne City R.R. Among the noteworthy buildings are the high school and the public library. The industries include babies' clothing and tanneries. It was settled in 1880. Population, 1940, 2,904; in 1950, 3,028.

Boy Scouts (*boi scoutz*), a worldwide movement whose purpose is to build the character of boys, educate them in citizenship, develop such moral qualities as trustworthiness, loyalty, helpfulness, bravery, and reverence, and train them in various practical skills. Lord Baden-Powell launched the boy scout movement in England in 1908. The Boy Scouts of America was incorporated in 1910 and chartered by Congress in 1916. More than 16,500,000 persons have been members of the Boy Scouts of America since its establishment. The membership in October 1950 was 2,655,883 individuals organized in 75,696 units. There are scout organizations in 46 countries throughout the world; total membership was about 4,500,000 in 1950.

There are different programs for various age groups. In the U.S. *Cub scouting*, a program for boys 8 through 10 years of age, is home-centered and leads to *Boy scouting*. The Boy Scout program, including rugged outdoor activities, camping, woodcraft, outdoor cooking, signaling, first-aid lessons, swimming, and citizenship projects for the community, applies to boys of 11 through 13. There is also the *merit badge plan* by which a boy reaching the rank of second class scout or that of explorer may specialize in any hobby or vocation which appeals to him. *Exploring*, open to young men of 14 and over, includes a program of advanced camping, wilderness hiking, sea activities, aviation, and intensive study of various vocations and hobbies.

Scouting units are sponsored by community agencies such as churches, schools, and service clubs. Local scout councils give leadership to the units within a given area.

See also *Baden-Powell of Gilwell.*

Boys' Clubs of America, a national federation of Boys' Clubs which was organized in Boston, Mass., in 1906. At present there are 325 Boys' Clubs with 300,000 boy members, with headquarters in New York City. The purpose of Boys' Clubs is the guidance of boys in health, physical, mental, vocational, social and character development. Activities include recreation: games, athletics and sports, arts and crafts, music and dramatics; vocational and individual guidance, and summer camps. Medical and dental care are also a part of Boys' Club programs.

Boys' Clubs are non-sectarian in control, leadership, and membership. Any boy can belong to a club at a nominal fee. Members range in age from 8 to 20, with those under 17 years of age predominating.

The staff of a club is made up of professional, trained workers for the instruction, leadership, and guidance of boys. Boys' Clubs have buildings which are equipped with recreation rooms, health clinics, reading and club rooms, vocational workshops, and assembly halls.

Boys Town (*boiz town*), a home and school for homeless and underprivileged boys ranging in age from 8 to 18 (acceptance ages, 8 to 16), 10 m. w. of Omaha, Neb. Founded in 1917 by the Rt. Rev. Msgr. E. J. Flanagan (*q.v.*) and known as Father Flanagan's Boys' Home, it offers a home and accredited schooling (third grade through high school) to boys who elect from their own number (approximately 1,000) a mayor and nine city councilmen to govern their municipality, Boys Town. Non-sectarian and non-proselytizing, the "city of little men" gives every boy an opportunity to learn a trade, to participate in athletics and various hobbies, and in the nationally famous Boys Town choir and band, to learn good work habits and to become a useful citizen.

Bozeman (*bōz'man*), county seat of Gallatin County, Montana, 95 m. s.e. of Helena. It is on the Gallatin River and on the Northern Pacific and the Milwaukee R.R.'s. It has a large trade in agricultural products, merchandise, and livestock. The surrounding country has gold, silver, coal, and iron ore deposits, and large interests in farming and stock-raising. Among its industries are flour mills, brickyards, stone quarries, canneries, cereal mills, breweries, machine shops, and seed houses, The Montana State Coll. is located here. Population, 1940, 8,665; 1950, 11,325.

Bozzaris (*bô-zär'ĭs*), MARCO, Greek hero and patriot, born at Suli, in the mountains of Epirus, in 1788; killed in battle Aug. 20, 1823. His life was one of military excitement and combat for liberty. He retired to the Ionian Islands after the fall of Suli, in 1803, and joined other refugees in a struggle to deliver his native country from the Turks. In 1820 he united with Ali Pasha and rendered valuable services. After the death of Ali Pasha, he continued his opposition to the Turks, and later united his forces with the Greek army, in which he became general. He was commander in chief of the Greek forces at Missolonghi in 1823. On August 20 he led his army in a daring night attack on the camp of the enemy, near Carpenisi, and routed the opposing forces with great slaughter. The Turkish army numbered about 13,000, and Bozzaris led 1,200 against the vanguard of 4,000 warriors. His successful exploits were attended with great skill and personal bravery, but he was slain while leading the final attack. The Greeks still celebrate his deeds in popular songs. His heroic bravery is recounted in a poem by Fitz-Greene Halleck, entitled "Marco Bozzaris."

Brabant (*brȧ-bănt*), a district in the central lowlands of Holland and Belgium. It formerly constituted an independent duchy, but has had many rulers and alliances in the past four centuries. In 1648 it was incorporated with the United Provinces, after the famous revolt of The Netherlands against King Philip. It was divided by the Peace of Utrecht in 1714, when a portion passed to the Spanish crown. It became a part of The Netherlands in 1814, and was again divided in 1830 into the provinces of Antwerp, North Brabant, and South Brabant. In the same year Antwerp and South Brabant were made a part of Belgium. North Brabant has an area of 1,980 sq. m., a population of 628,089, and belongs to Holland. The province of Antwerp has an area of 1,093 and a population of 875,682; and South Brabant, an area of 1,268 sq. m., and a population of 1,475,490. The southern portions are inhabited by Walloons, the central by Flemish, and the northern by Dutch. South of Brussels the language is chiefly French and in the northern part it is Flemish, Dutch, and German. The subdivisions are all densely populated. The soil is fertile, producing cereals, sugar beets, vegetables, and grasses, and large interests are vested in manufacturing. Among the large cities included are Antwerp and Brussels.

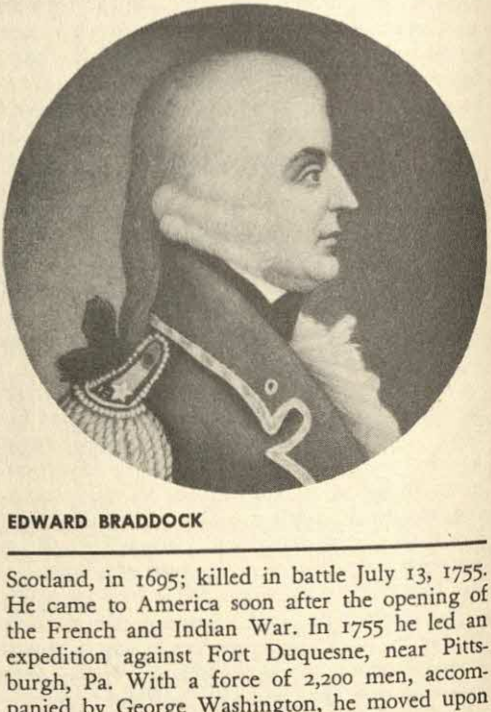
Brace (*brās*), CHARLES LORING, author and humanitarian, born at Litchfield, Conn., June 19, 1826; died at Campfer, Switzerland, Aug. 11, 1890. He was graduated from Yale in 1846, and continued his studies at Union Theological Sem. In 1850 he made an extended tour through England, Ireland, Germany, Belgium, and Italy. He lectured extensively, and established several institutions for the care of poor children and the poorer classes. His writings include: "Walks and Talks of an American Farmer in England," "Home Life in Germany," "Dangerous Classes of New York," "Hungary in 1851," and "Short Sermons to News boys."

Brachial Palsy (*brā'kĭ-al pôl-zĭ.*) See *Paralysis.*

Brachycephaly (*brăk-ĭ-sĕf'á-lȳ*), meaning a condition in which the width of the head measured across the cheekbones is great in relation to the length from the end of the upper jaw to the back of the cranium. In human head measurement, such a condition exists when the width is more than 80 per cent of the length, in contrast to *dolichocephaly,* in which it is less than 75 per cent and *mesocephaly,* when it is 75 to 80 per cent.

Braddock (*brăd'dŭk*), a borough in Allegheny County, Pennsylvania, on the Monongahela River, 10 m. S.E. of Pittsburgh. It is on the Pennsylvania, the Baltimore & Ohio, and other railroads. Among the chief buildings are the public hall, several schools, and the Carnegie Library. The manufactures include ironware, cement, plaster, boilers, steel rails, and railway cars. The city is also an important coal center. It is noted as the scene of the Battle of Braddock's Field, in 1755. The first settlement was made in 1795, and it was incorporated in 1867. Population, 1900, 15,654; in 1940, 18,326; in 1950, 16,488.

Braddock, EDWARD, soldier, born in Perthshire, Scotland, in 1695; killed in battle July 13, 1755. He came to America soon after the opening of the French and Indian War. In 1755 he led an expedition against Fort Duquesne, near Pittsburgh, Pa. With a force of 2,200 men, accompanied by George Washington, he moved upon his expedition. On the morning of July 9 an ambuscading party of 900 left the fort. The British were advancing through thick woods when they were assailed from all sides by French and Indians. For the first time many of the British heard the war whoop and were confused by the peculiar attack from behind rocks and trees. Braddock displayed great bravery, but was mortally wounded after five horses had been killed under him. Washington distinguished himself and successfully covered the retreat. Out of 1,373 British troops only 459 came off unharmed.



EDWARD BRADDOCK

Braddon (*brăd'ŭn*), MARY ELIZABETH, English novelist, author of "Aurora Floyd," wife of John Maxwell. See *Maxwell, Mrs. John.*

Braden (*brā′dẹn*), SPRUILLE, engineer and diplomat, born in Elkhorn, Mont., Mar. 13, 1894. He received his Ph.B. in mining engineering from Sheffield Scientific School at Yale Univ. (1914). His career as engineer and businessman began immediately after graduation when he went to South America in the employment of U.S. mining companies. During World War I he served as president of the Red Cross Society of Chile and of the American Society of Chile. After the war he was adviser to South American nations on U.S. loans and delegate to the Second Pan-American Financial Conference in 1920. He continued to further his business interests both in South America and in the U.S. until 1933 when he was appointed U.S. delegate to the International Conference of American States at Montevideo. He was a delegate to the Pan-American Commercial Conference at Buenos Aires (1935), chairman of the American delegation to the Chaco Peace Conference (1935-39), ambassador to Colombia (1939-42), ambassador to Cuba (1942-45), and Assistant Secretary of State for American Republic Affairs (1946-47). Outspoken in his opposition to the dictatorial policy of Juan Perón (*q.v.*) of Argentina, he resigned his post at the State Dept. in 1947. Braden served as president of the American Arbitration Assn. in 1949 and 1950.

Bradford (*brăd′fẽrd*), a city in McKean County, Pennsylvania, 80 m. s. of Buffalo, on the Erie, the Baltimore & Ohio, and the Pennsylvania R.R.'s. It is located in a productive oil field. The city has oil refineries, oil-well supply companies, machine shops, and manufactures of steel couplings, furniture, glass, paper boxes, brick, cutlery, and cigarette lighters. The first settlement was made in 1827, and it was incorporated as a city in 1879. Population, 1900, 15,029; in 1940, 17,691; in 1950, 17,354; in 1960, 15,061.

Bradford, a city and county borough of Yorkshire, England, about 28 m. s.w. of York. As the center of the worsted trade, it is noted for its manufacture of yarn and woolens; several hundred mills are in operation. It has several public parks and many charitable and educational institutions. The chief buildings include the town hall, the public library, the Cartwright Memorial Hall, in memory of Edmund Cartwright (*q.v.*), and the Art Museum. Several Protestant denominations have colleges in or near the city. Four miles west of the city is Thornton, the birthplace of Charlotte, Anne, and Emily Brontë (*qq.v.*). Transportation facilities include the Bradford Canal, electric railways, and four lines of railroads. Among the manufactures are cotton and woolen goods, clothing, soap, ironware, boilers, and liquors. The growth of the city in wealth and population was very rapid in the 19th century. It was incorporated in 1847 and became a city in 1897. Population, 1959 (est.), 289,100.

Bradford, GAMALIEL, biographer, born in Boston, Mass., Oct. 9, 1863; died in Wellesley Hills, Mass., Apr. 11, 1932. He was a semi-invalid and a recluse all of his life. A psychographer (psychological biographer) he attempted to present "soul pictures" of individuals. He was elected a member of the American Acad. of Arts and Letters (1931), and his works include "Studies of Robert E. Lee" (1912), "Confederate Portraits" (1914), "Union Portraits" (1916), "Life and I" (1928), and "The Quick and the Dead" (1931).

Bradford, WILLIAM, one of the Pilgrim Fathers, born in Austerfield, Yorkshire, England, in 1590; died in Plymouth, Mass., May 9, 1657. He went to Holland in search of religious liberty and joined the English congregation at Leyden. He came to America in the *Mayflower* in 1620 and was one of the signers of the Mayflower Compact. The following year he was elected governor of the Plymouth colony and served in that capacity for 31 years (1621-32, 1635, 1637, 1639-43, 1645-56). He wrote "History of Plymouth Plantation," covering the years 1620-47.

Bradley, OMAR NELSON, army officer, born in Clark, Mo., Feb. 12, 1893. He was graduated from West Point in 1915, commissioned 2nd lieutenant of infantry, and served in the U.S. as captain and then major during World War I. He later taught mathematics at West Point (1920-24) and tactics at the Infantry School, Fort Benning, Ga. (1929-32). One of the outstanding field commanders of World War II, Bradley was made full general in 1945 and general of the army in 1950. He commanded the U.S. 2nd Corps in Africa in 1943 and led the 1st Army into Normandy in 1944, in the breakthrough of St.-Lô

Courtesy Veterans Administration

OMAR N. BRADLEY

(see also *World War II*). He later commanded the 12th Army Group in northwestern Europe. Bradley was administrator of veterans' affairs in 1945-47 and was made Army chief of staff in 1948, succeeding Gen. Dwight D. Eisenhower. He became the first chairman of the Joint Chiefs of Staff in 1949, serving until 1953, when he retired to private industry. His "A Soldier's Story" was published in 1951.

Bradshaw (*brăd'sha̤*), JOHN, jurist, born in Cheshire, England, in 1602; died Oct. 31, 1659. He studied law and became chief justice of Chester in 1647, and in 1649 was president of the high court which tried and condemned Charles I. After the death of the king, he became president of the council of state, but he later opposed Cromwell. Milton eulogized him as a great jurist and statesman. After the restoration of the monarchy, his body was taken from the grave with those of Cromwell and Ireton and exposed on a gibbet.

Bradstreet (*brăd'strēt*), ANNE, poet, born in Northampton, England, in 1612; died Sept. 16, 1672. She was a daughter of Thomas Dudley and married Governor Bradstreet, and in 1630 went with him to New England. Her poems, though widely read, lack originality and poetic power. She has the distinction of being one of the first writers in America, and for this reason has a permanent place in the history of New England culture. She published a collection of her poems, in 1650.

Bradstreet, SIMON, colonial governor of Massachusetts, born at Horbling, England, in March 1603; died at Salem, Mass., March 27, 1697. His education was obtained at Emmanuel Coll., Cambridge, and for some time he was steward to the Countess of Warwick. He was sent to America in 1630 to serve as assistant judge of the court of Massachusetts. He held public positions for more than 60 years, and established a reputation as an able and trustworthy public servant. In 1660 he was sent to England to congratulate Charles II on his restoration to the imperial throne. He was one of the founders of Cambridge, Mass., and was prominent as an opponent to the famous witchcraft delusion of 1692 at Salem.

Brady (*brā'dĭ*), CYRUS TOWNSEND, clergyman and author, born in Allegheny, Pa., Dec. 20, 1861; died Jan. 24, 1920. He was graduated from the U.S. Naval Acad., but resigned from service and was connected for two years with railroads in the Mississippi Valley. In 1890 he was ordained a priest of the Protestant Episcopal Church and served as rector of churches in Missouri and Colorado, and for a time was archdeacon of Kansas. He was made archdeacon of Pennsylvania in 1895, serving until 1899, when he became rector of St. Paul's Church at Overbrook, Philadelphia, Pa. His writings include historical essays and several volumes of fiction.

Brady, MATHEW B., photographer, born in Warren County, New York, about 1823; died in New York City, Jan. 15, 1896. Brady, uneducated for the most part, early became interested in photographic processes. He was adept at daguerrotype portraiture and won several awards—national and international—for his work. In 1855 he became interested in the wet-plate photographic method, and he soon switched to that method entirely. Despite its clumsiness, Brady and his assistants were able to compile some 3,500 photographs, a lasting record of the leaders, battlefields, and camps of the Civil War. Brady, himself, became noted for his many photographs of Abraham Lincoln.

Braganza (*brä-gän'zä*), HOUSE OF, the name of the dynasty ruling Portugal, 1640-1910, and by which the imperial family of Brazil (1822-89) was known. The founder of the dynasty was John IV, Duke of Braganza, who ascended the throne in 1640, after throwing off the rule of Spain. It was named from the town of Bragança, Portugal. The town is the capital of the district of Braganza. The near-by ruins of an ancient fortress are a national landmark. Population, *ca.* 5,500.

Bragg (*brăg*), BRAXTON, soldier, born in Warren County, N.C., Mar. 22, 1817; died at Galveston, Tex., Sept. 27, 1876. After graduating from West Point in 1837, he enlisted for service in the Seminole War, and later distinguished himself at the battle of Buena Vista, in the Mexican War. In the Civil War, he entered the Confederate army, and was placed in command of the forces at Pensacola, Fla. He served at Shiloh, and, after the death of Gen. A.S. Johnston, was commander of the entire Southern forces. He invaded Kentucky in 1862 with 45,000 men, and was defeated at Perryville and again at Murfreesboro, but won the battle of Chickamauga in 1863. General Grant defeated him at Chattanooga the same year, when he was relieved of his command. In 1864, he was unsuccessful in checking the advance of the Union army under Gen. Sherman. After the war he held several official positions in Alabama.

Bragg, EDWARD STUYVESANT, soldier and legislator, born in Unadilla, N.Y., Feb. 20, 1827; died June 20, 1912. He studied at Geneva Coll., was admitted to the New York bar, and in 1849 went to Fond du Lac, Wis., where he built up a successful practice. In the Civil War, he entered the Union service, was with the Army of the Potomac, commanded the famous "Iron Brigade," and was mustered out as brigadier general. In 1877 he was elected to the Wisconsin legislature, and the following year was sent to Congress as a Democrat, and was reelected several times. Between 1888 and 1912, he held several diplomatic posts.

Bragg, SIR WILLIAM HENRY, physicist, born in

Wigton, Cumberland, England, in 1862; died, 1942. Bragg was educated at Trinity Coll., Cambridge. His early researches in radioactivity were carried on at Adelaide, Australia, where he held a professorship of mathematics and physics (1886-1908). At the Univs. of Leeds (1909-15) and London (1915-23), he continued his research in radioactive phenomena, developing a spectrometer in collaboration with his son, William Lawrence Bragg, which made possible an intensive study of the arrangements of atoms and crystals. Among the honors awarded him were a fellowship in the Royal Society (1906), the Nobel Prize for Physics (1915), and the presidency of the British Association for the Advancement of Science (1928-29).

Bragg, WILLIAM LAWRENCE, a British physicist and son of Sir William Henry Bragg (*q.v.*); born in Adelaide, Australia, in 1890. Educated at Cambridge, he occupied the chair of physics at Victoria Univ., Manchester, and later at Cambridge. He was joint author with his father of "X-rays and Crystal Structure" (1915); and with his father shared in the Nobel Prize for Physics (1915). He invented an electrical device, used in World War I, to locate enemy artillery.

Brahe (*brä*), TYCHO, celebrated astronomer, born Knudstrop, Denmark, Dec. 4, 1546; died Prague, Czechoslovakia, Oct. 24, 1601. He descended from a noble Swedish family which had resided in Denmark for some years. He studied philosophy and rhetoric at Copenhagen, and after the great eclipse of the sun of Aug. 21, 1560, which occurred at precisely the time foretold by the astronomers, he began to study astronomy, regarding it as something divine. His uncle sent him to Leipzig to study law, but he continued studying astronomy with profound interest. He constructed various apparatus with which to gain knowledge of the heavenly bodies, and in 1571 was favored by an uncle with aid to secure material and appliances to carry on his investigations. Frederick II, King of Denmark, bestowed upon him the island of Hven, in the Sound, on which to erect an observatory and laboratory, together with a pension of 2,000 crowns out of the public treasury. Fitted up in this way, he built a castle which he named *Uranienburg.* With the death of the king his pension was discontinued, and he was compelled to leave the country, owing to poverty and the general opposition of his countrymen, and he spent the remainder of his life in Germany. Rudolph II, King of Germany, showed him many marks of respect and granted him a pension of 3,000 florins. The great astronomer, Kepler, was with him as a student. After his death Kepler made use of his discoveries and apparatus, which he used effectively in his own astronomical researches.

Brahma (*brä'mȧ*), BRAHMANISM (*brä'mạn-ĭz'm*), Brahmanism represents one of the great world religions, for the most part represented in India. However, it is also at the same time a special Indian caste system which originated long before Christ. As a religion today, it is subdivided into many sects which differ from each other less in theological respects and ethical concepts than in the emphasis on social composition and variation of rites. Historically, in contrast to Christianity and Mohammedanism, Brahmanism does not teach the thoughts of one mythological or historical individual but represents an integration of religious, ethical, and social concepts which the immigrating Aryans (*q.v.*) had already developed before the Vedas (*q.v.*), probably about 2,500 B.C. The main gods are nature gods of Heaven, Air, and Earth, gradually merging into the Brahma. However, the essential difference from European religions should never be forgotten, *i.e.,* that the religious idea is inseparably bound up with the idea of a caste system, or to be more specific, a system consisting originally of four castes. These four castes included the philosophers, scholars and statesmen, warriors, and laborers. Today, however, these four early castes have developed into many hundreds with the Hindu (*q.v.*) as the dominant. There are very exact prescriptions and rites which govern the relationships of these castes to one another.

Brahma has a double meaning. On the one hand it means the essence of nature and existence. This essence has not created the world but continually approaches and penetrates the world. It emanates from and radiates toward the world. This process makes it more and more impure the longer the distance of the emanated Brahma becomes from its original source. Therefore, nature, life, and especially human life, has to be considered as a kind of more or less impure Brahma. All worldly phenomena such as pain, sin, suffering, illness and death are considered evil. Besides being in the above-described manner an abstract principle, pure at its source, more or less impure in the world, Brahma also means a personification of this principle. As such it can be approached by prayer.

In order to escape the evils of this world, the human soul has to be purified, has to ascend a stepladder of incarnations. Later on in the development of Brahmanism, this concept was simplified and more ethically motivated. Now, the sphere in which the next incarnation takes place depends on the behavior and deeds of the human soul. As in early Christianity, a complete asceticism (*q.v.*) is considered the surest way to perfection. This perfection, once achieved, gives the perfect knowledge of divine essence.

Since this whole concept is rather abstract, it was always understood only by a few spiritual leaders. The masses, as in the development of each religion, looked for the personification of a helping redeemer and finally created an amalgamation of two earlier popular gods, Vishnu (*q.v.*), and Siva (*q.v.*), and the abstract idea of Brahma. The idea of one god and the belief in the first person, Brahma, were too abstract to endure for a long period of time. This led to a general worship of Vishnu, the preserver, and Siva, the destroyer, and the worship of these two deities now constitutes the two great religious sects of India. However, these two deities are worshiped only as a means to reach the one first cause, or Brahma. The worship of Vishnu is conducted under the forms known as Krishna and Rama, and that of Siva under the form called Lingam, with the power of Sukti—the power and energy of the divine nature in action. In their trinity, Brahma holds the position of the creator.

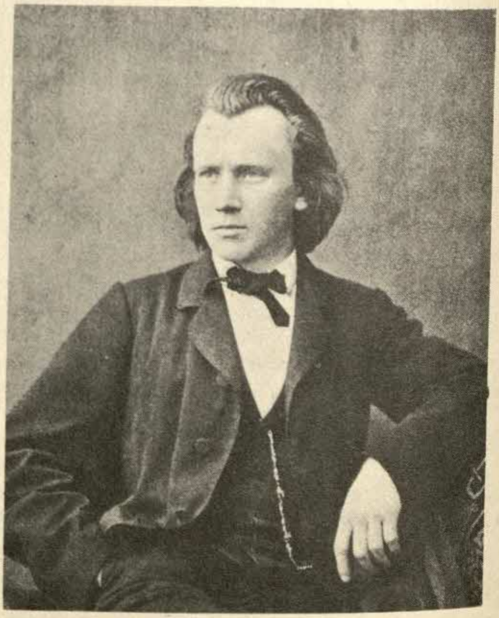
In Indian art he is sometimes, but not generally, represented with four heads and four arms. However, it must be emphasized that his personality is not as clearly defined as the gods in other religions and that the meaning of Brahma oscillates constantly between the personal god as part of the above-mentioned trinity, and the abstract idea of a mere principle.

Out of differing opinions about which element in the trinity has to be emphasized most, the various sects have developed. Each of these sects in their competition today refers to certain holy writings of the past, especially to the "Puranas" (*q.v.*). Actually, today, the Brahmans have the functions of priests and leaders of ceremonies, regulating the sacrifices of any kind and each act of life, in accordance with the holy writings such as the Vedas (*q.v.*). There are no special temples to Brahma but the holy rites can be executed almost anywhere. Temples are dedicated to local and nature gods which had always been venerated besides Brahma.

Buddhism (*q.v.*) has to be considered as a protestant movement developed out of Brahmanism, and in some respects directed against it. Since the caste system is of such decisive influence in the theological and theocratical system the word "Brahman" has become synonymous with the member of a superior class, as in referring to the "Brahmans" of Boston.

Brahmaputra (*brä-mȧ-pōō′trȧ*), meaning "son of Brahma," one of the great rivers of India. It rises in the plateau of Tibet and has a length of 1,800 m. In the upper part of its course, where it is known as the Sampo, it flows southeast along the northern slope of the Himalayas, and as it turns southward through the mountains it assumes the name of Dihong. In Assam it receives the inflow from a number of tributaries and is generally known as the Brahmaputra, a name applied by some writers to its entire course. It joins the Ganges about 90 m. from the Bay of Bengal, where they discharge after forming a common delta. The stream overflows in the rainy season and when the mountain snow melts, usually in June and July, and floods vast plains, rendering them fertile for the production of great quantities of cereals. More than 800 m. are navigable for commercial traffic, while the several channels of the delta furnish excellent inland connection. The river was first explored by Europeans in 1765.

Brahms (*brämz*), JOHANNES, composer, born in Hamburg, Germany, May 7, 1833; died in Vienna, Apr. 3, 1897. His father, who was noted as a double-bass player, taught the young Brahms the rudiments of music but his main teacher in piano and composition was Eduard Marxsen at Altona. As early as 1847 he played successfully in Hamburg, and in 1853, through the recommendation of the great violinist, Joseph Joachim, Brahms met Schumann, who was so favorably impressed with the young musician that he expressed the view that Brahms would make a high reputation in promoting the development of modern music. Meanwhile, his first compositions, such as the impressive Piano Concerto in D Minor, began to appear, but in spite of the admiration of Schumann and Joachim, the public was slow to recognize Brahms's genius. He was forced to accept minor positions as a piano teacher and choir-master at the court of the Prince of Lippe-Detmold. Then followed years of study in Hamburg, Zurich and Vienna. Later, he settled in Vienna (1872), where he first held the position of conductor of the Singing Acad., and after five years of concert tours throughout Germany and



JOHANNES BRAHMS

Austria, became director of the Society of Friends of Music. His reputation was established in 1868, when his "German Requiem" was rendered at Bremen. Symphonies, written in the traditional four-movement form, followed, as well as the well-known Second Piano Concerto for violin, and the great orchestral compositions such as the "Tragic Overture" which brought him world-wide fame. Brahms is also important as a composer of "Lieder," songs which in their folk-song-like mood are classics in their field.

Brain (*brān*), that part of the central nervous system of animals that is found within the skull. It is held to be the seat of intellectual and mental power in man. The shape, when viewed from above, is somewhat like that of an egg. In composition it is soft and yielding, closely filling the cavity of the skull. It is inclosed in a double membrane called the *arachnoid,* which is as delicate as the web of a spider, and which forms a closed sac filled with a liquid resembling water. Within this and within the spaces of the brain is a fine tissue. The tissue, called *pia mater,* is penetrated by many blood vessels, which pass through the hollows. The flow of blood to the brain is so copious that about one-fifth of the entire circulation of the body is used. The *dura mater* is a tough membrane which lines the bony cavity of the skull and incloses the entire brain mass, and separates the various parts of the organ by strong partitions.

The brain consists of three main parts called the *cerebrum,* the *cerebellum,* and the *medulla oblongata.* The cerebrum consists of two lateral hemispheres united by a thick, strong band of white tissue, and comprises about seven-eighths of the weight of the entire brain. In the lowest animals the cerebrum is wanting. It makes its appearance as the scale of animals rises to higher forms. This part of the brain occupies the front and upper part of the skull. The bulk is composed of white nerve fibers. The fibers intimately connect with the fibers of the gray layer of nervous matter, which is found at the surface. The surface is wrinkled and folded, which gives ample surface for the gray matter, in some individuals as much as 675 sq. in. The cerebrum is the center of thought and intelligence. The cerebellum is located in the back of the head, below the cerebrum. It is smaller than the cerebrum, but in construction is quite similar, except that it has parallel ridges instead of convolutions. This enables the gray matter of the cerebellum to lie in the white matter within. The cerebellum is the center for the control of the voluntary muscles, particularly those of motion. The various movements of the body, such as grasping, balancing, and walking, arise in the cerebellum, while the nerve-cells of convolution in the cerebrum are the seat of volition, consciousness, and educational intelligence, and of the faculty of language.

The medulla oblongata is the upper enlarged part of the *spinal cord.* It extends from the upper border of the first vertebra to the *pons,* which are connected at each side with the cerebrum above and the cerebellum behind. It is divided by tissue into a right and left portion, and the latter is separated by grooves into four columns. When the cerebrum is injured by disease or otherwise, persons become unable to converse intelligently, both from inability to remember words and a loss of power to articulate them. In an idiot this portion of the brain is not well developed. In persons having an injured or diseased cerebellum there is a tendency to totter and walk with uncertain movements as if intoxicated; all their movements and work are irregular.

Man possesses a large cerebrum in proportion to the weight of the brain, while in lower animals the cerebellum is larger than the cerebrum. The cerebrum seems to be large in order to provide for an emergency in case of injury. Small parts of the human brain have been lost by accident and in war, and, after recovery from the wounds, men suffered little or no impairment of their mental faculties. This is somewhat analogous to an instance in which a person has lost the use of one eye, the other eye supplying sight.

The average weight of the human brain is about 45 ounces in females and 50 ounces in males. The ability of a man does not depend upon the size of the brain so much as upon its quality, but it is known that men of great ability possess large brains, and that the brains of cultured races are much larger than those of savages. It is subject to many diseases, which usually prove either decidedly harmful or fatal. They include *brain fever, tumors,* and *inflammation of the brain.* See also *Tumor.*

Surgery of the brain developed rapidly through the needs of the two World Wars. The innumerable operations which became necessary thereby, very much enlarged our knowledge of the exact location of certain mental faculties. Delicate as the brain is, it is nevertheless possible today to operate on the living organism to extract bullets, splinters, etc. In many cases, sight, the faculty of speech, and other human capacities can thus be reconstructed.

Brainerd (*brān'ẽrd*), county seat of Crow Wing County, Minnesota, about 115 m. s.w. of Duluth, on the Northern Pacific and the Minnesota & International R.R.'s. It is surrounded by a rich agricultural country, and is a grain and jobbing center. The manufactures include flour, machinery, clothing, paper, and earthenware. It has flour mills and extensive railroad shops. In 1883 it received its charter. Population, 1950, 12,637.

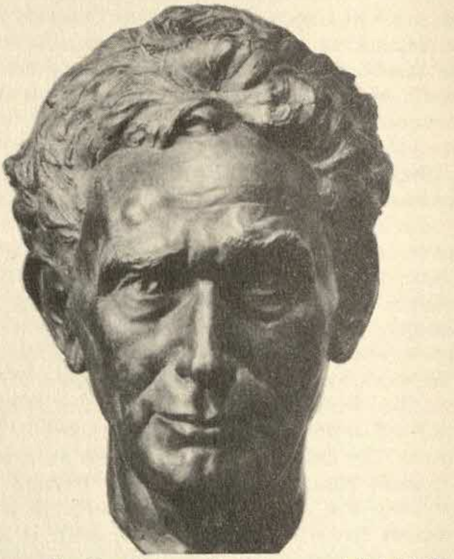
Braintree (*brān'trê*), a town of Massachusetts, in Norfolk County, 10 m. s. of Boston, on the New York, New Haven & Hartford R.R. It is the seat of Thayer Acad. and the Thayer Public Library. The manufactures include cotton goods, boots and shoes, hardware, paper, and machinery. Large granite deposits are worked in the vicinity. The first permanent settlement was made on its site in 1634, and the town was incorporated in 1640. Population, in 1940, 16,378; in 1950, 23,161.

Brake (*brāḳ*), a device for retarding or arresting motion by means of friction. In railroad cars and machinery it consists of a simple or compound lever, connected with a shoe or band, which is forcibly pressed on the periphery of the wheel that is to be stopped or reduced in its speed. The problem of supplying suitable brakes for railroad and street cars has engaged the attention of inventors for several decades. Hand or foot and hand brakes are now used largely for retarding motion in automobiles, etc., while air and electric brakes are common on street and railway cars and in large machinery. In an air brake either the compression or vacuum may be used. In the former the air is compressed by a pump attached to the engine and is conveyed to cylinders under the cars by means of pipes, where it acts on the brake levers. The vacuum method is the reverse; the air is exhausted from the device beneath the car, and the brake levers are acted on by atmospheric pressure. The electric brake is used largely on electric railways. It is constructed so the car motor will become a dynamo as soon as it is disconnected from the trolley wire, and as such it generates a force sufficient to act upon the brake levers.

Brake, or BRACKEN, a class of ferns found in many parts of America and other continents. It is large and coarse and has a creeping rootstalk, from which naked stalks about 15 in. high grow up. It grows in rocky regions and on hillsides. The early frosts kill the annual growth, and in the spring new shoots come up from the rootstalk or rhizome, which has a bitter taste and is used to a limited extent as a substitute for hops.

Bramble (*brăm'b'l*), the name of a kind of blackberry native to Great Britain. This plant is not cultivated for its fruit, which is of a fair quality, because it spreads rapidly and in this respect resembles an obnoxious weed. The word *bramble* is used in America to describe collectively such plants as the blackberry and raspberry.

Brandeis (*brăn'dīs*), LOUIS DEMBITZ, lawyer and publicist, born in Louisville, Ky., Nov. 13, 1856. He studied at Harvard Law School and began the practice of law at Boston. Although associated professionally with many great corporations, he became an advocate of sociological reforms and greater conservation of public resources. He was an associate justice of the U.S. Supreme Court, 1916-39, when he retired. In addition to his interest in social problems, he was an active supporter of Zionism. He died in 1941.



Courtesy Metropolitan Museum of Art, N. Y.

LOUIS D. BRANDEIS

Bust by Eleanor Platt

Brandenburg (*brăn'dẹn-bûrg*), a province and city of Prussia, in Germany. The province has an area of 15,383 sq. m. It is fertile for farming. Rye and barley are the chief cereals, and tobacco, fruit, and vegetables are grown. Brown coal is mined extensively, but manufacturing is the leading industry. The chief towns are Kottbus, Potsdam, and Frankfort-on-the-Oder. The population is *ca.* 4,000,000, nearly all of whom are German Protestants. The former ruling family of Germany, the Hohenzollerns, came into the possession of Brandenburg in the 15th century; in 1711 they ascended to the kingly line of Prussia; and in 1871 became the imperial family of Germany. The city of Brandenburg is on the Havel River, 35 m. s.w. of Berlin. It has extensive factories producing woolens, leather, silk, pottery, machinery, chemicals, and clothing. The city has a large trade in merchandise. Population, *ca.* 50,000.

Brandes (*brăn'dĕs*), GEORG MORRIS COHEN, critic and historian, born in Copenhagen, Denmark, Feb. 4, 1842. His "Main Currents" is in six volumes and comprises a review of the literature of France, England, and Germany. Other works include: "French Aesthetics," "Criticisms and Portraits," "Berlin as an Imperial Court," "Impressions of Russia," and "Aesthetic Studies." Several of his writings were in German, and these include "Lord Beaconsfield" and "Ferdinand Lassalle."

Upholding a skeptical philosophical attitude towards religion, Brandes's last book, "The Jesus Myth," written in this vein, became very famous. He died in 1927.

Brandon (*brăn'dŭn*), a city of Canada, in Manitoba, 132 m. w. of Winnipeg, on the Assiniboine River. It has a large trade in grain and live stock. Brandon was founded in 1881, has car shops, and is located in a fertile farming country. Population, 1901, 5,620; in 1941 (*est.*), 16,975.

Brandy (*brăn'dȳ*), a liquid secured by distilling grape wine, manufactured chiefly in France. Both red and white wines are used. The brandy known as *Cognac* manufactured in the department of Charente is considered the best grade, and is transported to America in large quantities. High grades of brandy are made on the Pacific Coast, where the vine attains a prolific growth. Brandy is used in medicines, for stimulants and restoratives, and as a beverage. The amount of alcohol contained in brandy depends upon the wine from which it is distilled. Some of the higher classes contain a larger per cent of alcohol and are expensive. The product made in California is considered, by some, equal to the French varieties. The pure quality consists almost entirely of alcohol and water, and is wholly colorless until it is put in kegs, when it takes on the color of wood. *Apple-jack,* a kind of brandy, is made from apple cider, while another variety is made from peach wine.

Brandywine (*brăn'dȳ-wīn*), a small stream in Pennsylvania flowing into the Christiana Creek at the city of Wilmington, Del. The stream became historic on account of the Battle of Brandywine, which was fought on its banks Sept. 11, 1777, between the British and Americans, in which the latter were defeated. The American forces consisted of 13,000 men under Gen. Washington, and the British of 18,000 under Lord Howe.

Brant (*brănt*), JOSEPH, an Indian chief, born in Ohio, in 1742; died near Lake Ontario, Nov. 24, 1807. He accompanied his two elder brothers in a campaign with Sir William Johnson against the French on Lake George. Later he attended the Indian school at Lebanon, Conn., and became skilled as an interpreter. In the Revolutionary War he fought with the British and engaged in many bloody raids against the colonists. In 1777 he took part in the battle of Oriskany, and later raided the Mohawk Valley with 300 Indians and Tories. After the war a tract of land was granted to the Indians at his request on the north side of Lake Erie. He became converted to the Christian cause while on a visit to Europe, and raised funds to build a church in Canada, the first Episcopal church erected in the Dominion. He translated a number of works, including the English prayer book and the gospel of Mark, into the Mohawk language. A statue was built in his honor at Brantford, in Ontario. His youngest son, John, was an active participant in the War of 1812.

Courtesy Brown Bros., N. Y.

JOSEPH BRANT

Brant (*bränt*), or BRANDT, SEBASTIAN, poet and humanist, born in Strasbourg, Germany, in 1458; died May 10, 1521. He studied at the Univ. of Basel, where he became professor of philosophy and jurisprudence, and later was appointed an imperial councilor by Emperor Maximilian. His "The Ship of Fools," in which he ridiculed the vices and follies of his time, was translated into Latin and made him famous among the scholars of Europe. An English translation was made by Alexander Barclay in 1509. Brant ranks as an important forerunner of the literature of the Reformation.

Brantford (*brănt'fērd*), a city of Ontario, in Brant County, 70 m. E. of London, on surfaced highways and on the Canadian National and the Canadian Pacific R.R.'s. It is located on the Grand River and is surrounded by a fertile farming, dairying, and stock-raising country. It has manufactures of stoneware, machinery, engines, clothing, and flour, and has a brisk trade in farm produce and merchandise. It is the seat of the Ontario Inst. for the Education of the Blind and of Wickliffe Hall. The Bell Homestead is located in Brantford, the home of Alexander G. Bell, inventor of the telephone. Population, about 30,000.

Branting (*brȧnt'ing*), KARL HJALMAR, former prime minister of Sweden, born in Stockholm, Nov. 23, 1860; died Feb. 24, 1925. Branting studied astronomy at the Univ. of Upsala but abandoned a scientific career to become editor of a radical paper, *Tilden.* The paper lasted only two years, and he was then made editor of a new journal, *Sozial-demokraten,* where he worked until 1917.

Branting became one of the founders and leader of the Swedish Social Democratic Workers party in 1889 and was the first representative of his party to the Rikstag (1897). He served as minister of finance in 1917 and 1918 and was prime minister, 1920, 1921-23, 1924-25. For 20 years a delegate to the Paris Société des Nations, he was also his country's representative in the League of Nations Council. In 1921, Branting was awarded, with Christopher Lange, the Nobel Prize for Peace.

Courtesy American-Scandinavian Foundation

KARL HJALMAR BRANTING

Courtesy French Press & Information Service, N. Y.

GEORGES BRAQUE

Braque (*brȧk*), GEORGES, artist, born in Argenteuil, France, May 15, 1882. He studied painting under several teachers and soon was recognized as an exceptional artist. Braque was one of the artists who, in 1908, working with Picasso, began the movement in art known as cubism (*q.v.*). This school was not concerned with subject matter and realism *per se,* but with the fundamentals of organization, design, and plasticity, and has had far-reaching effects in the art world. Braque's main choice of subject matter is still life. Best known of his works are many untitled still-life paintings, "The Blue Mandolin," "The Road to Estaque," "Standing Woman," and "Cliffs at Varengeuille."

The whole development of European and American art after 1910 is unimaginable without the appearance of Picasso and Braque. They were the first to develop an independent style emphasizing the structural elements in painting. Cézanne had gone beyond his contemporary French impressionists in presenting three-dimensional, spatial structure very clearly, but his painting still represented the external world. Braque and Picasso did not try to depict what they saw. Instead, they abstracted certain visual elements from their surroundings and reconstructed these elements. They did not stress resemblances to actuality, but rather the rhythm (design) on the canvas. In other words, they created a new world whose elements were composed by geometrical forms abstracted from natural forms.

Brass (*brăs*), an important alloy of zinc and copper. It is hard, ductile, and malleable, and the color is a bright yellow. Formerly it was made from calamine mixed with copper and charcoal. This process is easier than the fusion of copper and zinc. The proportion of copper and zinc varies, but ordinarily from 28 to 34 per cent of zinc is used. It is harder and yet more easily fusible than copper, and is more sonorous. Brass resists the influence of the atmosphere better than copper, but requires a varnish or lacquer to prevent tarnishing, and is readily turned on a lathe, rolled, and stamped.

Brass was used in very ancient times, and is mentioned in the cuneiform writings of the Chaldeans and the Assyrians. In the Middle Ages it was made chiefly in the form of sheets, and was used for household utensils and for a number of purposes in churches. The ancient method of making brass was by heating copper with calamine, a native ore of zinc, and charcoal. James Emmerson patented a process for the direct production of brass from copper and zinc in 1781, and this has superseded the older methods. It consists of first melting the copper in a crucible, then adding small quantities of the zinc, and when the two metals are thoroughly mixed, which is brought about by stirring, the molten brass is cast into molds made of sand or iron. Owing to the volatility of the zinc, considerable of this metal is lost during the operation unless much care is exercised.

One part of zinc and two parts of copper, by weight, is a good working basis in making brass.

If the proportion of zinc is increased, the compound loses in tenacity, while an increase of copper adds to its strength and tenacity. When the proportion is 1 part of zinc to 10 of copper, the result is a reddish-yellow brass. If a small per cent of lead is added to the alloy it diminishes its ductility. The addition of tin increases the hardness of brass. *Tombac* and *pinchbeck* contain 80 parts or more of copper to 20 or less of zinc. *Bristol brass, similör, Mannheim gold,* and *prince's metal* are names used to describe brass made by using different proportions of zinc and copper. In the arts, brass is close in importance to iron and steel. It is used in making buttons, organ pipes, household utensils, and machine parts.

Brassey (*brăs'ĭ*), THOMAS, railway contractor, born at Buerton, near Chester, England, Nov. 7, 1805; died at Hastings, Dec. 8, 1870. He was apprenticed to a surveyor at 16 and obtained his first engagement as a railroad contractor in 1835 for the completion of a portion of the Grand Junction Ry. He also completed the line from London to Southampton and in 1840 built a railroad from Rouen to Paris, France. Subsequently he obtained contracts in Holland, Prussia, Spain, and Italy, as well as in France, England, Wales, and Scotland. His largest contract was for the construction of the Grand Trunk Ry. in Canada, of which line he built 1,100 m., and constructed the great bridge at Montreal over the St. Lawrence. He received many decorations, including the cross of the Legion of Honor from France and the Iron Crown from Austria. He amassed a large fortune, despite several heavy losses.

Bratislava (*brä'tĭ-slä-vȧ*), formerly known as Pressburg (Presburg), also known as Poszony, the capital city of Slovakia, a region of eastern Czechoslovakia, on the Danube River, 35 m. E. of Vienna. It is beautifully situated on a range of hills belonging to the Little Carpathians and has railroad and steamboat facilities. Formerly the kings of Hungary were crowned in Bratislava; the city contains the remains of a once beautiful royal palace. It has a cathedral of Gothic construction, a fine Franciscan church, and several hospitals, parks, libraries, and monuments. It is the seat of Comenius Univ., the Technical Univ. of Slovakia, and the Slovak School of Economics. Among the manufactures are woolen and silk goods, wooden articles, musical instruments, tobacco products, paper, leather, chemicals, starch, machinery, and ironware. It was the capital of Hungary from 1541 to 1784, but in the latter year the Emperor Joseph made Buda the capital. Bratislava was the seat of the Diet until 1848. In 1939, when the Germans divided Czechoslovakia and set up Slovakia as a separate state, Bratislava became the capital of Slovakia. The city fell to the Russians Apr. 4, 1945, during the Allied drive which liberated Czechoslovakia from German occupation. Population, 1947, 172,664.

Brattleboro (*brăt''l-bûr-ō*), a town located in southeastern Vermont, 8 m. from the New Hampshire state line. The principal manufactures include optical and drug products. It is a winter sport center. Brattleboro was chartered in 1753 and named for Col. William Brattle. Population, 1940, 9,622; in 1950, 9,606.

Brauchitsch (*brou'kĭch*), HEINRICH ALFRED VON, former commander-in-chief of the German army, born Oct. 4, 1881. Son of a cavalry general, he attended the *Französische Gymnasium* in Berlin and was made lieutenant in the Royal Elizabeth Guard Grenadiers in 1900. During World War I he served on the general staff and remained in the *Wehrmacht* after the German defeat in 1918. Rising through the ranks, he became major general (1931) and chief of artillery (1932). A confirmed militarist, bent on the restoration of the German army, he viewed Hitler as a means to that end. He was advanced from command of the East Prussian area to colonel general and commander of the German army in 1938. He proved himself a skillful and powerful military politician, and as a member of Hitler's military council received credit for the construction of the West Wall and for many German military exploits in World War II. The Allies charged him with sharing responsibility for the German war crimes and he was indicted in 1945. He died in Hamburg, Germany, Oct. 18, 1948 while awaiting trial as a war criminal.

Braun (*broun*), KARL FERDINAND, physicist, born in Fulda, Germany, June 6, 1850; died in New York, Apr. 20, 1918. After lecturing at Marburg, Strasbourg, Tübingen, and Karlsruhe, he returned to Strasbourg as professor of physics and director of the Physical Inst. in 1895, and began his researches in electricity. He first became well known as the inventor of an electrometer and a cathode ray tube to investigate the forms of electromagnetic oscillations, the so-called Braun tube. In 1898 he began research on wireless telegraphy. A survey of his work, "Wireless Telegraphy Through Water and Air" (1901), described his attempts to send signals through water by means of high-frequency currents, his introduction of the closed circuit of oscillation into wireless telegraphy, and his pioneer work in sending electric waves in definite directions. In 1909, Braun received the Nobel Prize for physics, with Marconi, for developments in wireless telegraphy.

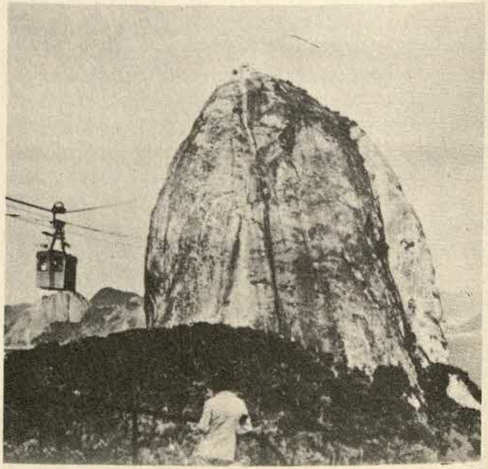
Brazil (*brȧ-zĭl'*), county seat of Clay County, Indiana, about 15 m. E. of Terre Haute, on the Chicago & Eastern Illinois and other railroads. It is located in a rich farming country, and near it are productive coal fields. The manufactures include pig iron, terra cotta, boilers, machinery, and pottery. It has a good jobbing trade, a public library, courthouse and other public buildings. The region was settled in 1856, and Brazil was incorporated in 1873. Population, 1900, 7,780; in 1930, 8,744; in 1940, 8,126; in 1950, 8,434.

Brazil, UNITED STATES OF, the largest country of South America, occupying the eastern and central part of that grand division. It extends from north lat. 5° to south lat. 34°, and from west long. 35° to 74°. Its extreme length from north to south is 2,665 m., extreme breadth, 2,688 m. In extent of territory it is one of the largest political subdivisions, exceeds in area the Commonwealth of Australia, and is somewhat smaller than the U.S. exclusive of Alaska and the insular possessions. It is bounded on the north and east by Colombia, Venezuela, Guiana, and the Atlantic, while its southern and western boundaries are formed by the Atlantic, Uruguay, Argentina, Paraguay, Bolivia, Peru, and Ecuador. It lies entirely east of the great Andean system, and touches every South American country except Chile and Ecuador. Area, 3,275,510 sq. m.

SURFACE. The surface consists of two great sections, the lowlands known as the Amazon basin and the elevated plateaus of the central and eastern parts. The lowlands comprise the basins of the Amazon and other great rivers, extending from the Tocantins to the Guiana Plateau, which rises gradually toward the north and forms the larger part of the northern boundary, culminating in the Tumuc-Humac Mts., between Brazil and Guiana, and the Parima Mts., which lie on the boundary line of Venezuela. The elevated plateaus of the central and western parts are made up largely of the highlands of Brazil, which have an elevation of from 2,000 to 10,000 ft. above the sea, culminating in Mt. Itatiaia, west of Rio de Janeiro. These highlands are made up of many ranges, one of which separates the basin of the Paraná from that of the Paraguay, and trends northward between the Tocantins and the São Francisco. The highest of these ranges trends parallel to the coast, which is known as the Serra do Mar south of Rio de Janeiro, and as Serra do Espinhaco north of that city. Brazil has a coast line of about 4,000 m. The coast south of Cape St. Roque is more or less broken and furnishes good harbors, while north of that point it is comparatively low with an extensive coast plain. Most of the fertile land is found in the basin of the Paraná and the Amazon. Marshes and swamps characterize different sections of the country, especially the valley of the Paraguay and of the regions in the lower valley of the Amazon.

DRAINAGE. The Amazon and the Tocantins drain more than two-thirds of Brazil. About one-fourth of the drainage is by the Paraná, the Paraguay, and the Rio de la Plata, and the remainder is carried by the Sao Francisco and smaller streams. The Amazon, which is formed by the union of streams that rise in the Andean Mts., has a general easterly course toward the Atlantic, and receives a large number of important tributaries. These include, besides the Tocantins, which joins it in one branch of the delta, the Purus, Javari, Juruá, Madeira, Tapajos, and Xingú from the south, and the Ica, Yupurá, and Negro from the north. This river system has a length of 19,000 m., and the navigable distance is placed at 13,000 m. Near the delta the basin is narrow, not more than about 150 m. wide, but it expands inland and occupies all of the northeastern part of Brazil. The São Francisco and a number of smaller streams drain the eastern section, and the southern part is drained by the Paraguay, Paraná, Iguassu, and Uruguay Rivers. These rivers are of more than passing importance in the commercial history of the country, chiefly for the reason that, until the recent construction of interior railways, they furnished the only means of transportation in the vast interior of Brazil.

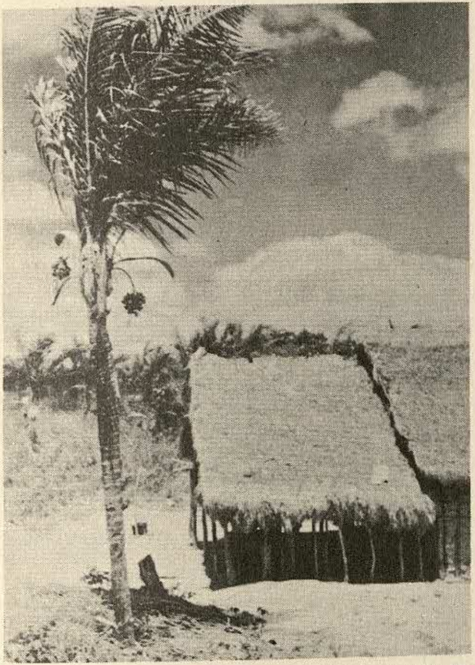
CLIMATE. The Tropic of Capricorn passes on a line drawn a short distance south of Rio de Janeiro, hence Brazil lies almost entirely within the tropics. Rainfall is abundant in all parts of the country, ranging from 70 to 100 in. annually. It is distributed quite uniformly in all sections, but is greatest in the valley of the Amazon. Two seasons, the wet and the dry, alternate each other, the greatest amount of precipitation extending between January and June. The seasons are influenced by the movement of the trade winds, which follow the sun from north to south, and depend somewhat upon the character and elevation of the surface. Near the mouth of the Amazon, particularly toward the south, and in some parts of the plateau region, the rainfall is limited, especially



Courtesy Brazilian Gov't. Trade Bureau, N. Y.

BRAZIL. SUGAR LOAF

between the Paraná and the São Francisco. The climate is quite even throughout the year. The maximum temperature is 95°, and in most places does not fall below 70°, except in the higher altitudes, where it ranges from 30° to 90°.



Courtesy Brazilian Gov't. Trade Bureau, N. Y.

BRAZILIAN PLANTATION SCENE

Minerals. Brazil has vast and largely unexploited mineral wealth. The gold deposits are chiefly in Bahia and Minas Gerais, and these two states have the largest interests in mining this mineral and in the output of diamonds. Iron ore is found in many sections of the Brazilian highlands and in the mountains of the Guiana plateau. Until recently, little progress had been made in mining this ore on account of a scarcity of cheap fuel and labor. Santa Catherina and Rio Grande do Sul have extensive deposits of bituminous coal and a good grade of lignite is found in many sections. Other deposits include silver, copper, zinc, rock salt, and kaolin. Many mineral springs and deposits of gas and petroleum abound.

Manufacturing. Brazil has not taken a foremost position among the nations in the output of its manufacturing enterprises, chiefly for the reason that it is not densely populated and consequently lacks a large supply of skilled labor and cheap capital. However, the vast natural resources and a determined government policy in this direction have in the past generation brought considerable advances. Food processing has become the largest industry, closely followed by textile and chemical manufacture. The cotton and woolen mills are located chiefly in the states of Minas Gerais, Rio de Janeiro, and São Paulo. Shipbuilding is an important enterprise at Rio de Janeiro and a number of other seaports. Cigar making and the manufacture of rum and other alcoholic drinks are important industries. Leather is made in large quantities. Other manufactures include matches, soap, clothing, machinery, and straw hats.

Agriculture. The valley of the Amazon is the most fertile region and contains the largest forests in the world, but many parts of it are covered with dense tropical vegetation. This accounts largely for the section not being developed for farming. However, it is important for its timber, which yields vast quantities of dyewood, rubber, nuts, and lumber.

Farming is developed most extensively in the southeastern part, in the states of São Paulo, Bahia, Minas Gerais, and Rio de Janeiro. In this section are large coffee plantations, and in the production of coffee Brazil takes first rank. Sugarcane is cultivated profitably in these states and in Pernambuco, and cotton is grown in all of the Atlantic states. Tobacco is grown largely, especially in Bahia, and rice and maize are cultivated extensively in São Paulo and Minas Gerais. Other products include potatoes, beans, yams, vegetables, and Paraguay tea. All the domestic animals reared in North America thrive, but attention is given chiefly to the rearing of cattle and breeding of horses.

Flora and Fauna. The flora is tropical and may be classified according to three zones, that of the southeastern plateau, that of the lower Amazon basin, and that of the west central section. The plants in the southeastern part, near the Tropic of Capricorn, are numerous and luxuriant, but somewhat farther northwest the rainfall diminishes and the region is diversified by open country and small forests. In the lower Amazon basin the vegetation is most luxuriant, and includes a large variety of grasses, vines, and forest trees. Here thrive the mangoes, mangroves, palms, silk-cotton tree, rosewood, cinnamon, Brazil nut tree, and the *seringa* or rubber tree. The eucalyptus, which has been introduced from Australia, thrives in this section. Vegetation in the southwestern part is smaller and the number of plants fewer, owing to a somewhat scant rainfall, but the prairies are covered with nutritious grasses and contain scattered groves of trees.

Many animals abound in the forests and on the plains. The larger animals include the puma, ocelot, jaguar, and tapir. Monkeys are very abundant in the selvas, and deer abound in the southwestern region. Anteaters, armadillos, sloths, opossums, and peccaries are plentiful. The boa, jararaca, and rattlesnake are among the reptiles. There are many varieties of fish, among them the angel fish, the pirarucu (the most important Amazonian food fish), the piranha, and the Amazon lungfish. Among the birds found in Brazil are trumpeters, macaws, green parrots, rheas, and many song birds.

TRANSPORTATION. The railways of Brazil, mainly government owned, have a total length of nearly 24,000 m. There are some 280,000 m. of highways, and about 22,000 m. of navigable inland waterways, mostly rivers, which are the chief means of travel into the interior. Some parts of the country are still accessible only by air. A large merchant marine serves the ports on Brazil's long coastline, as well as ports of foreign countries.

TRADE. Brazil's trade balance is relatively stable. The 1960 total import figure was $1,462,000,000, and the export figure, $1,269,000,000. The U.S. share of Brazilian imports varied from $254,510,000 in 1955 to $534,916,000 in 1958 but in 1960 reached only $426,881,000; exports to the U.S. amounted to $632,533,000 in 1955, $564,645,000 in 1958, and $570,213,000 in 1960. The next largest trading countries are Great Britain, Germany, Argentina, France, Japan, and Italy. Coffee is the most important export commodity, constituting about 60 per cent of the total value of exports. Cotton ranks next in value, followed by sawed pinewood and iron ore. The imports consist chiefly of machinery, chemicals and pharmaceuticals, petròleum, wheat, and fuel and diesel oil.

EDUCATION. About 50 per cent of the population 15 years of age or over is literate. Education is free and compulsory for children between the ages of seven and 12, and the study of Portuguese is compulsory. In 1958 there were *ca.* 83,000 primary schools, with over 5,775,000 pupils. In 1959 there were nearly 3,500 secondary schools, with *ca.* 795,000 pupils. Commercial, agricultural, and industrial schools trained (1959) *ca.* 200,000 students. There are more than 20 official universities, with a student enrollment of more than 80,000 in 1957. Most of these universities have been founded since 1946; the first was the Univ. of Brazil, at Rio de Janeiro, in 1920. The School of Public Administration in Rio de Janeiro trains civil servants for all Latin-American countries.

GOVERNMENT. Brazil is a republic and for the purpose of government is divided into 20 states, 5 federal territories, and 1 federal district (Rio de Janeiro). Under the constitution adopted in 1946, the president and vice president are elected for five-year terms and are not eligible for successive terms. The president's cabinet consists of the ministers of finance; justice and the interior; foreign affairs; transport, communications, and public works; agriculture; labor, industry, and commerce; education and culture; public health; and war, marine, and air. The legislature consists of a senate of 63 members, elected for eight years (the senate being renewed every four years, alternately, by one-third and

Courtesy Joannini

NATIVE GIRL CRACKING BRAZIL NUTS

20th-CENTURY CAPITAL

Impressive ceremonies marked the inauguration (April 21, 1960) of the capital city, Brasília. The photo shows the modern congressional buildings, framed by two members of Brazil's elite Dragoons of Independence by two-thirds), and a chamber of deputies with a potential membership of 326, elected for four years. In 1961 a parliamentary form of government was instituted. It provides for a premier, chosen by the president with congressional approval.

The court of justice at Rio de Janeiro is the highest judicial authority in Brazil; its 11 justices are appointed by the president with the approval of the senate. Each state maintains its own executive, legislative, and judicial authority; for the purpose of local government, each is divided into municipalities and districts.

POPULATION. The population of Brazil is greater than that of any country in America except the U.S., but the average density is only about 13 persons per sq. m. Of the total population, exclusive of Indians, about 62 per cent is white, 26 per cent mulatto, 11 per cent Negro, and less than 1 per cent Asiatic, mainly Japanese, and other. The foreign-born population of Brazil includes mainly Portuguese, Italians, and Germans.

The majority of the population (93 per cent) is Roman Catholic, but there are sizable groups of Protestants, Jews, Buddhists, and Spiritists. Church and State were separated in Brazil in 1889, reunited in 1934, and separated again in 1946. Brasília (pop. *ca.* 100,000) was built purposely to be the capital and was so designated in 1960. Important cities are Rio de Janeiro (the former capital), São Paulo, Recife, Salvador, Pôrto Alegre, Belo Horizonte, Belém, Santos, Fortaleza, Niterói, Curitiba, and Maceió. The total population of Brazil in 1960 was 70,500,000.

HISTORY. Despite evidence that Brazil was known to the Portuguese before 1450, the discovery of the country is usually credited to a Spaniard, Vicente Yañez Pinzón, or to the Portuguese Pedro Alvares Cabral. Both reached the area, a few months apart, in 1500. Sporadic exploration followed, but extensive settlement was delayed for some time. In 1530 grants were given to individuals empowered to establish colonies and to develop trade. Despite Indian hostility, several cities had had their beginnings by the time a colony was established on the Bay of Rio de Janeiro in 1567. The discovery of gold and diamonds early in the 18th century spurred immigration from Europe, especially from Portugal and Spain. Under the guidance of the royal family of Portugal, the house of Braganza, which was expelled from Portugal by the French in 1807 and took refuge (1808) in Brazil, the country enjoyed marked prosperity in commerce and internal improvements. On May 13, 1822, the eldest surviving son of King João of Portugal was chosen "Perpetual Defender" of Brazil, and on Sept. 2 of that year he declared Brazil independent of Portugal and was crowned emperor, ruling Brazil, as Pedro I, until 1831, when he voluntarily abdicated and returned to Portugal. The government was administered by regencies for the next nine years, until a popular agitation led to the declaration of the majority of the young prince, then 15 years of age, and his coronation as Pedro II. He reigned successfully for 48 years but was dethroned on Nov. 15, 1889, by a revolution, and Brazil became a republic. The Brazilian constitution, modeled on that of the U.S., was promulgated in 1891. The first constitutional president was Deodoro da Fonseca, who resigned almost immediately. Only after 1902, however, did Brazil regain prosperity.

During World War I Brazil favored the Allies and, after the entry of the U.S., declared war against Germany. Beginning in the early 1930's and continuing for more than 20 years, the

Courtesy Moore-McCormack Lines, Inc., N. Y.

COFFEE DRYING

Brazil takes first rank in world production of coffee

Courtesy Wide World Photos

PRESIDENT JOÃO GOULART

During a New York City parade, April 5, 1962 country was largely under the influence of Dr. Getulio Dornelles Vargas, who became president in 1934. Despite totalitarian measures, Vargas succeeded in making important strides toward modernizing Brazil's industry, stabilizing the government, raising living standards, and improving the working conditions, education, and health of Brazilians. At the beginning of World War II, he attempted to adopt a policy of friendly neutrality toward the Allies, but in 1942 Brazil declared war against Germany and Italy and in 1943 against Japan. In 1945 Brazil became a charter member of the U.N. Changing economic and political conditions as the result of the war forced Vargas' resignation in October 1945, but his former war minister, Gen. Eurico Gaspar Dutra, was chosen president, and Vargas himself became a senator. In the face of continued discontent over inflation and the suppression of civil liberties, a new constitution was proclaimed on Sept. 18, 1946. In 1947 the Communist party, which had been held responsible for much of the country's instability, was declared illegal in Brazil; but inflation and Communist influence continued to plague the Dutra government. In 1951 Vargas returned to the presidency. He sought to bolster Brazil's sagging economy with foreign aid, but opposition to his administration finally led to his overthrow and subsequent death by suicide in August 1954. He was followed by a series of acting presidents, until January 1956, when Juscelino Kubitschek was inaugurated president. He was followed by Jânio da Silva Quadros in 1961, who resigned after eight months in office; Vice Pres. João B.M. Goulart became president after the establishment of a parliamentary government.

Brazil Nut (*brȧ-zĭl′ nŭt*) or CREAM NUT, also called monkey nut, the nut of several species of trees of the genus *Bertholletia,* of which *Bertholletia excelsa* is the chief species. The trees are sometimes as much as 150 ft. tall, with tough, undivided leaves 2 ft. long and 6 in. wide. The trees bear large white flowers, followed almost a year later by large, hard-shelled, box-like fruits. Inside each fruit are 18 to 24 of the familiar hard-shelled nuts, arranged much like the sections of an orange. All the nuts are gathered from wild trees in the forests of the Amazon region.

Brazilwood (*brȧ-zĭl′wŏŏd*), a kind of wood derived from a tree of the pea family, *Cesalpina echinata,* which grows wild in the forests of the Amazon. The red heartwood of the tree is considered the best wood for the manufacture of violin bows.

Brazilwood is historically significant as the source of the name of Brazil. In the Middle Ages, red wood (from Asiatic sources), highly prized as a source of red dye, was known as *brasil.* After 1500, when the Portuguese were exploring the Amazon region, they discovered an American source for a red dye wood. At that time, it was one of the region's most valuable products, and the country was named after the wood.

Brazos (*brä′zôs*), a river in Texas, formed by the confluence of the Salt Fork and Double Mountain Fork in the northern part of the state. It flows southeast for *ca.* 850 m. and empties into the Gulf of Mexico at Freeport.

Brazza (*brȧ-zȧ′*), PIERRE SAVORGNAN DE, explorer, born in Rome, Italy, Jan. 26, 1852; died in Dakar, French West Africa, Sept. 15, 1905. He came from a noble family of Italy, but received his education in the schools of France. In 1875 he entered the French Navy and the following year went on an expedition of discovery to Africa. He explored the Ogowe River and several streams flowing into the Congo, and in 1879 reached the site of Brazzaville (*q.v.*) before Stanley visited that section. In 1882 he returned to Europe, but soon went back to Africa as lieutenant commander, and in 1883 was appointed governor of the entire French Congo. He was reappointed governor in 1891. To him, France owes her possessions in West Central Africa.

Brazzaville (*brăz′-ạ-vĭl*), capital of the Republic of the Congo (Brazzaville), in Central Africa, on the north bank of the Congo River, opposite Léopoldville (*q.v.*). It is a trade center and starting point for navigation on the Congo-Ubangi river system and is connected with Pointe-Noire, an Atlantic seaport 240 m. away, by the Congo-Ocean R.R. It was founded (1880) by Pierre de Brazza (*q.v.*). Population, *ca.* 100,000.

Bread (*brĕd*), an article of food made of the flour or meal of grain, usually of wheat, rye, and sometimes of barley, corn, or mixtures of wheat flour, whole wheat flour, rye flour, potato flour, and corn or barley flour or meal. The word bread is often used in its broadest sense to designate all the components of the diet.

Bread may be prepared from flour, or meal, mixed with water, or milk, and salt so as to form a dough having a consistency such that one can knead it by hand or by machines. It may be leavened or unleavened. If unleavened, the dough may be formed into a small roll, biscuit, or scone and baked in an oven or on a heated plate, griddle, or slab of stone.

Leavened bread and rolls are made by mixing flour, usually sifted wheat flour or wheat and rye flour, water or milk, salt, and yeast. In commercial practice, sugar, shortening, dough conditioners, malt or malt syrups, and dextrinized starches may be added to the dough. The mixing is carried on under controlled temperature, usually by mechanical means. The consistency of the dough is carefully controlled. The ash content, diastatic activity (pertaining to the conversion of starch into sugar), and protein content serve as indexes of flour quality. Dough conditioners, such as bromates, are used to condition the gluten and to improve its mechanical properties. Diastatic malts or fungal enzymes are used to modify starch and to convert some of the starch to sugar and dextrin.

There are two types or methods of breadmaking in general use: the straight dough and the sponge and dough process. In the former, all the ingredients are mixed in one operation. The dough is held under controlled temperatures and humidity, in troughs, and fermented for several hours (or for a few minutes in certain methods of bread production, as in short-time doughs. In continuous methods, the dough is mixed and passes from the mixer into the pan). The straight dough is usually allowed to rise to maximum value and then turned and folded. It is then sent to machines which divide it into successively smaller portions, until it is formed into equal sized pieces of the weight necessary to form a loaf of bread. The dough starts this procedure weighing some 300-800 lb. and ends it divided into 18-20-oz. portions. The individual units or dough loaves are then allowed to rise and ferment for 10 to 12 minutes; the dough is molded either by hand or mechanically and put into pans to rise again to a definite bulk. After the bulk is attained the pans are placed in the oven and the bread is baked at 375-450° F. In the case of hearth bread, the molded dough loaf is placed directly on the hearth and baked. After baking, the bread is cooled to about 95° F. and may then be wrapped.

The sponge and dough process is used in most U.S. bakeries. A portion of the flour, 50-70 per cent of the total weight used, water, yeast, dough conditioners and diastatic malt, if used, and shortening are mixed and formed into a dough called the sponge, which is permitted to ferment in a trough until it has matured to the desired point. It is then returned to the mixer, and the doughing ingredients, which represent the remainder of the water, flour, sugary agents, salt, milk, shortening, and yeast are added, if the total amount of any of them has not already been added. The final dough is mixed until it is smooth and homogeneous, then goes through the operations already discussed.

The composition of white bread, enriched, varies somewhat depending on the flour, percentage of milk used, percentage of shortening, sugar, and salt. The enrichment ingredients, thiamin, riboflavin, niacin, and iron, should be present in amounts at least equivalent to minimum values. The following analysis is representative of enriched bread sold by some of the leading bakers in the northern U.S. A 1-lb. loaf of white bread when purchased would consist of: 4% nonfat milk solids, no more than 38% water, 8.25% protein, 3.56% fats, 48.45% carbohydrates, and 1.83% ash. The quantities of enrichment ingredients would be as follows:

Ingredient	Unit	Units per pound		
		Usual	Minimum	Maximum
Thiamine (B_1)	Mg.	1.23	1.1	1.8
Riboflavin (B_2)	"	0.85	0.7	1.6
Niacin	"	10.57	10.0	15.0
Iron	"	11.35	8.0	12.5
Calcium	"	397.0	300.0[1]	800.0
Vitamin D	U.S.P. units	—	150.0[1]	750.0

[1] Optional.

The resulting loaf of bread would have 1,167 calories per pound.

Baked products, such as biscuits, prepared from cereal ingredients, such as wheat flour, water, milk, shortening, salt, sugar, and chemical leavening agents, are widely used in the South. The baked products have a different flavor, color, grain, and texture from that of yeast-leavened products. Chemical leavening agents consist of sodium bicarbonate or carbonate of ammonia and an acid ingredient, such as lactic acid (sour milk), tartaric acid, or bitartrates, calcium acid phosphates, sodium acid pyrophosphates, sodium aluminum sulfate, glucono-delta-lactone. The gas produced by the reaction of the acid with the soda leavens the dough. Self-rising flours usually contain calcium acid phosphates and soda. When water is added, carbon dioxide is released, which leavens the batter or dough.

The Food and Drug Admin., by provision of the Federal Food, Drug and Cosmetic Act of 1938, promulgates standards for various types of bread and rolls, such as white bread, white bread enriched, whole wheat bread, graham bread, milk bread, and raisin bread.

Breadfruit (*brĕd′fro͞ot*), the fruit of a Pacific island tree, *Artocarpus altilis,* of the mulberry family. The tree is of medium height, with large, heavy, usually lobed leaves. Male and female flowers are borne in separate dense clusters. The female flower cluster ripens to form a melon-shaped fruit, weighing 20-40 lb., which consists mostly of the starchy flower stem. Breadfruit is the staple food of the islands. When cooked, it takes the place served by potatoes in northern countries. Fruits ripen throughout the year.

In the regular breadfruit, the flowers abort as they do in pineapples and produce no seeds, the whole flower stem, with the flower bases, being edible as a vegetable. Some varieties, however, ripen numerous seeds, called *breadnuts,* which can be eaten after they are boiled or fried.

Break-Spark (*brāk′-spärk*), an intense spark produced when the magnetic vibrator of the induction coil is opened, breaking the electrical circuit to the battery. Because of the rapid decrease of the primary current when the vibrator opens, a large electromotive force is produced in the secondary coil. The terminals of the spark gap attached to the secondary coil have an intense spark between them. The make-spark occurring when the magnetic vibrator is closed is much smaller, because of the lower rate at which the primary current builds up.

Breakwater (*brāk′wạ-tẽr*), a wall, mole, pier, or some similar structure placed at the entrance of a harbor with a view of deadening the force of the waves which roll in from the ocean. Breakwaters are variously constructed of floating bridges, made of wood, brick, stone, and iron, or suspended from chains, and of solid walls or mounds built up from the bottom of the water, with stone inclosing large blocks of concrete. Some breakwaters were used to serve as fortifications against seagoing invaders. Sections of breakwaters also were utilized as foundations for the dwellings of fishermen and pilots. We find famous breakwaters mentioned frequently by Roman writers. Among the notable breakwaters in the Great Lakes is the one at Chicago, protecting the harbor of the city against the waves of Lake Michigan. It is built on a solid stone basis and incased with wooden beams. Another solid structure is at Buffalo, on Lake Erie, another at Cleveland, and a third in Delaware Bay. Among the most noteworthy in Europe are those at Cherbourg, France, and Plymouth, England. The one at Cherbourg was proposed by M. de Cessart to the French government, and is the largest and most expensive ever constructed. It was completed by Napoleon III at a cost of nearly $3,000,000. They are constructed from 1 to 5 m. from the shore, this depending upon the depth of the water and the conditions surrounding the city or harbor to be protected.

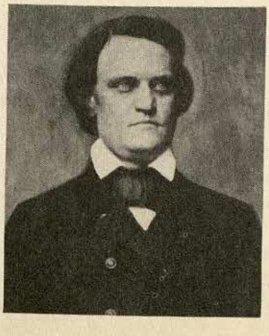
When European nations began to go to sea, more and more technically perfect constructions appeared all along the coast of Europe, especially along the Atlantic coast in France, England, and The Netherlands. Some of the most noteworthy breakwaters of antiquity were those at Marseilles and Alexandria. Among famous modern breakwaters are those at Zeebrugge, Belgium, and the special kind of floating breakwater sent by the English to the French invasion ports during World War II as a debarkation protection.

Breasted (*brĕs′tĕd*), JAMES HENRY, historian and Orientalist; born at Rockford, Ill., Aug. 27, 1865; died Dec. 2, 1935. In 1894 he led his first archeological expedition into Egypt. He was appointed to the department of Oriental languages, Univ. of Chicago, in 1915. In 1919 he became director of the Oriental Institute of Chicago; during 1920, he was in charge of its archeological survey in Mesopotamia. He received the Rosenberg Medal in 1929 for his work on the history of civilization. He wrote several books in collaboration with others. Chief among his own works are: "A History of Egypt: From the Earliest Times to the Persian Conquest" (1905); "A History of the Ancient Egyptians" (1908); "Development of Religion and Thought in Ancient Egypt" (1912); "Ancient Times: A History of the Early World" (1916); "Survey of the Ancient World" (1919); "Ancient History Atlas" (1920); "Conquest of Civilization" (1926).

Brèche-de-Roland (*brĕsh-dĕ-rô-län′*), a pass in the Pyrenees, between Spain and France, located a short distance west of Mont Perdu. It was so named from Roland, who, according to a legend, opened the rock with his sword Durandal so the army of Charlemagne could pass through. The defile is about 200 ft. wide and is bordered by rocks that rise almost perpendicularly on both sides.

Brecht (*brĕkt*), BERTOLT, dramatist and poet, born in Augsburg, Germany, Feb. 10, 1898; died in Berlin, Aug. 14, 1956. Educated in Germany, he won his first recognition at the age of 24, with *"Trommeln in der Nacht"* (Drums at Night). His literary output was marked by an expressionist tendency and included such successful productions as *"Die Dreigroschenoper"* (1928; Eng. version, "The Threepenny Opera," 1933), after "The Beggar's Opera" by John Gay (*q.v.*), with music by Kurt Weill (*q.v.*); and *"Mutter Courage und ihre Kinder"* (1941; "Mother Courage," 1955). He lived in exile from 1933 to 1949 and then returned to East Germany, where he spent his last years.

Breckinridge (*brĕk′ĭn-rĭj*), JOHN CABELL, Vice President of the U.S., born near Lexington, Ky., Jan. 21, 1821; died there, May 17, 1875. He was educated at Centre Coll. of Kentucky and Transylvania Coll., and practiced law in Lexington. He served in the Mexican War and was then sent to the state legislature and the U.S. Congress. He was a Representative until 1856, when he was elected Vice President. Recognized for impartiality in this high office, he nevertheless was nominated for the Presidency by Southern Democrats in 1860 and received 72 electoral votes. In 1861 he entered the U.S. Senate but was expelled when he joined the Confederate army. He took part in the battles of Shiloh, Baton



J. C. BRECKINRIDGE

THE SURRENDER AT BREDA

The painting, executed about 1635 by Diego Velásquez (1599-1660), depicts the surrender of the Dutch at Breda (1625) to the Spanish under Gen. Ambrogio di Spinola, after a siege of almost ten months

Rouge, Chickamauga, Chattanooga, and others and rose to the rank of major general. Shortly before the end of the war, he was secretary of war in the Confederate government but fled the country at the end of the conflict, to return in 1868.

The Breckinridge family (sometimes spelled Breckenridge, mostly before the time of John Cabell) is prominent in the U.S. and included James Breckenridge (1763-1833), soldier, lawyer, and politician; John Breckinridge (1760-1806), Attorney General under Lincoln; John Breckinridge (1797-1841), Presbyterian clergyman; and William Campbell Breckinridge (1837-1904), lawyer, editor, and Congressman.

Breda (*brā-dä'*), a city in southern Netherlands, in the province of North Brabant, at the confluence of the Aa and Merk rivers. It is a trade center, and its manufactures include carpets, cigars, clothing, iron, and machinery. Since 1828 the Royal Military Acad. has been located here. Breda is an old city that in former centuries was strongly fortified. Between 1581 and 1637, it was alternately in the hands of the Dutch and the Spanish; but the treaty of Westphalia in 1648 granted it finally to Holland. The peace of Breda, concluded between Britain, France, and Holland in 1667, gave to the British certain colonies in North America, including New Amsterdam. Breda was the scene of battles during the wars of the French Revolution, and it was heavily bombed during World War II.

Population, 1960, 107,127.

Breech-loading Rifle (*brēch'-lōd'ĭng rī'fl*) or GUN, a type of firearm in which the powder charge and the projectile, or bullet, are introduced at the breech end of the piece instead of at the muzzle. All small arms of the sporting and military type used today are breech-loaders. The first practical breech-loaders were used by the British under Lt. Col. Patrick Ferguson, the inventor, in the Battle of King's Mountain during the American Revolution (1780). Ferguson was killed in this battle and no further use was made of his gun. The first effective breech-loader, the Dreyse needle gun, was used in large numbers by the Prussians in 1842. In th Franco-Prussian War (1870-71), this needle gun contributed greatly to the victories of the German armies.

Both Union and Confederate troops used muzzle-loading guns at the opening of the War Between the States, but breech-loading rifles were in general, if not in official, use in the Union army at the end of the war (1865). Immediately after the war, the War Department adopted a breech-loading rifle of the single-shot type. This was used until about 1890, when the army adopted the Krag-Jorgensen, bolt-action, repeating rifle. This was replaced by the M1903 (Springfield) rifle. Just prior to World War II, the army then adopted the M1 (Garand) gas-operated, semi-automatic rifle, which subsequently proved to be the outstanding service rifle of this war. See *Rifle*.

Breeding (*brēd'ĭng*), the art of continuing or improving breeds of domestic animals by continuous care in feeding and pairing. All animals and plants are susceptible to modification under systematic cultivation. This fact has been turned to advantage by combining in individual specimens a number of good qualities found in several different kinds of original stock. The principles taken advantage of are those of heredity, variability, selection, and crossing. The germs of all that is desired must be found in the specimen to be improved, and the process must be by slow development during long periods of time, else an essential loss will occur in some line at the expense of the higher qualities desired. Breeding for the improvement of all kinds of domestic animals has shown excellent results since the beginning of the last century, although considerable attention was paid to horse breeding from remote periods. The production of increased yields in quantity and fineness of wool in sheep, and beef and milk in cattle, is especially marked, while breeding in swine has largely increased the annual returns to farmers. One important principle to be observed is that the best results are produced between animals comparably similar, changing the breed gradually to the higher quality.

Bremen (*brĕm'ẹn*), an important free city and seaport in Germany, on the Weser River, 46 m. from its mouth. The free district has an area of 99 sq. m., and, besides the city, includes Bremerhaven, a port on the estuary of the Weser. Bremen is one of the most important and historic cities of Europe. It was made a bishopric in the year 787 by Charlemagne, and was for some time a member of the Hanseatic League of cities. It became a free city in 1646. The French held it from 1806 to 1815. In 1871, it became part of the German empire. A Communist element gained control of the city in 1918, following the German defeat, but was soon overthrown. In 1933, it came under National Socialist control. Prior to World War II, Bremen was a shipping center of the German export and import trade, and the most important port for tourists. Its foreign commerce extended to all the countries of the world, including a large trade with the U.S. Pre-war imports aggregated more than $100,000,000 worth of commodities, while its exports were correspondingly large. The manufactures include sugar, tobacco products, ironware, machinery, pottery, fabrics, chemicals, cordage, steamboats, and engines. Among the chief buildings are a Gothic council house, the town hall, the merchants' house, the exchange buildings, and a cathedral begun in 1050. In front of the town hall is the famous statue of Roland, medieval symbol of a free town. The school system is open to free admission and attendance is compulsory. The public schools carry courses which range from the kindergarten to the high school. It has a large public library, two extensive parks, and modern harbor and wharf improvements. The city is a focus of many railroads and canals. Intercommunication is by a system of electric railways, with branches to Bremerhaven and many inland points. In World War II it was heavily bombed by the Allies. After the surrender of Germany in 1945, Bremen came under combined British-U.S. control. Population, *ca.* 350,000.

Bremer (*brā'mẽr*), FREDRIKA, Swedish novelist, born 1801; died Dec. 31, 1865. Her reputation rests on novels such as: "The Neighbors," "The President's Daughter," "Brothers and Sisters," and "Homes in the New World."

Bremerton (*brĕm'ẽr-tŭn*), a city of Kitsap County, Washington, on the shores of Puget Sound, plotted in 1891 by William Bremer, who sold land in the same year to the Puget Sound Navy Yard. The U.S. Navy Yard represents an investment of $65,000,000, handles a civil payroll of $9,000,000 annually, and spends $2,000,000 each year in the city markets. Yard facilities include provision for cruisers, destroyers, airplane carriers and smaller craft. The shipbuilding dock is the largest in the world. Here also is one of the world's largest machine and electric shops. Population, 1940, 15,134.

Brenham (*brĕn'am*), county seat of Washington County, Texas, in the south central part of the state. It is surrounded by a fertile grain and cotton country, and has diversified industry. It was first settled in 1844, and was incorporated in 1866. Population, 1940, 6,435.

Brenner Pass (*brĕn'ẽr pȧs*), lowest of the Alpine passes, 4,588 ft. elevation, connecting Northern Italy with Germany, open throughout the year, and crossed by a railroad. Belonging to the Austrian province of Tyrol, it became part of Italy in 1920. Historically important as the route of the barbarian tribes who overran Rome early in the Christian era, it was used by Napoleon I in his Italian campaign, was the scene of battles in World War I, and became a strategic military route in World War II.

Brentano (*brĕn-tä'nō*), CLEMENS, novelist and poet of the Romantic school, born 1778 at Ehrenbreitstein, Germany; died 1842. The brother of Bettina von Arnim, known for her correspondence with Goethe (*q.v.*), he compiled (1806-08) a famous collection of German folk songs, *"Des*

CLEMENS BRENTANO

Contemporary etching

Knaben Wunderhorn," with his brother-in-law, Achim von Arnim. Among Brentano's novels, "*Gockel, Hinkel und Gackeleia*" (1838) became best known. Toward the end of his life he turned toward Catholic mysticism.

Brereton (*brâr′t′n*), LEWIS HYDE, U.S. Army officer, born in Pittsburgh, Pa., on June 21, 1890. He entered the U.S. Naval Academy at Annapolis, being graduated as an ensign in 1911. After two months in the Navy he resigned and was commissioned as a 2nd lieutenant in the Coast Artillery Corps. He was soon transferred to the Aviation School at San Diego, Calif., and in World War I he served as commander of the 12th Aero Squadron, one of the first American flying units on the front. During the years between the wars he was stationed at numerous air bases, both at home and abroad, becoming an expert on aerial bombardment. During World War II, as a major general, he commanded U.S. Air Forces, first in the Philippines, then in India, and later in the Middle East. The devastating bombardments of the Rumanian oil fields at Ploesti are outstanding examples of his tactics. He is the author of "The Brereton Diaries," a history of recent air warfare.

Brescia (*brā′shä*), a city in northern Italy, capital of a province of the same name, about 150 m. from Turin, with which it is connected by railroads. The manufactures include silk and linen textiles, machinery, pottery, and firearms. The surrounding country produces considerable quantities of raw silk, fruits, and cereals. Brescia is noted for its fine churches and cathedral, and contains several botanical gardens, hospitals, a museum of antiquities, a theater, and an extensive public library. It is mentioned in history as early as 15 B.C., when it became a Roman colony. Charlemagne captured it in 774, and it was long a possession of Germany. In 1859 it was ceded to Sardinia and the following year was united with Italy. Population, *ca.* 125,000.

Breslau (*brĕs′lou*), a former German city which was the capital of Prussian Silesia. Situated at the junction of the Ohlau and the Oder Rivers, it was one of the largest cities in Germany. An outstanding industrial city, it produced woolen, silk, linen, and cotton goods, jewelry, machinery, lace, earthenware, soap, firearms, and various other staple products. Its commerce in flax, timber, hemp, metals, corn, and coal was extensive.

Breslau was of Polish origin and was long occupied by Poles and Bohemians. It afterward passed to Austria, and was conquered by Frederick II of Prussia in 1741. Breslau long ranked among the important educational cities of Germany; its university was founded by Leopold I in 1702. In 1938 the institution had an enrollment of 2,500 students and a library of 350,000 volumes. The city has many magnificent churches, among them a Protestant church of St. Elizabeth, with a steeple 364 ft. high. While the city retains a number of old parts, it has been largely affected by modern trade and architecture.

The two parts of the city are connected by a number of bridges across the Oder. The city is joined to others by several canals and railroads, and has an extensive urban and interurban system of electric railways. Breslau has frequently been besieged; during its forward drive early in 1945, the Red Army made Breslau the site of a large-scale battle. After the defeat of Germany in World War II the city came under Polish administration and was named Wroclaw. Population, 1939, 615,000; in 1946, 170,656.

Brest (*brĕst*), a seaport city of France, in the department of Finistère, 385 m. w. of Paris. It occupies a site on the Bay of Brest, at the mouth of the Penfeld River, and is connected by railways with other cities. Its harbor is one of the best in France and it is an important naval station. It has large manufacturing and trading interests. In 1914 and subsequently it became important as a depot for supplies and a landing place for soldiers from America. During World War II, it fell to the Germans in 1940, but was recaptured by the Americans, Sept. 20, 1944. Population, 1946, 74,991.

Brest-Litovsk (*brĕst′-lyĕ-tôfsk′*), a city of Poland, in the government of Godno, at the junction of the Bug and Mukhavetz Rivers. In 1795 it was transferred from Poland to Russia. The inhabitants are largely Poles, Russians and Germans. The Germans captured it in 1915, and it was made the seat of the peace conferences between the Central Powers and Russia in 1917, and was the site of battles in World War II (*q.v.*). Population, over 50,000.

See also *World War I*.

Breton (*brē-tôn′*), JULES ADOLPHE, painter, born in Courrières, France, May 1, 1827. He was educated at St.-Omer and at Douai; his paintings are devoted mostly to peasant life, and are exhibited in many galleries. He died July 5, 1906.

Brett (*brĕt*), GEORGE HOWARD, soldier, born Feb. 7, 1886, in Cleveland, O. He received his engineering degree from Virginia Military Acad. (1909), and in the following year was commissioned a second lieutenant in the Philippine Scouts. After duty in various army posts in the U.S., Brett was transferred to the air corps in 1915. As a captain, he went to France in 1917 to handle the purchase, storage, and distribution of all U.S. Air Corps material in that country. After service of a wide and varied nature, Gen. Brett became chief of the air corps in May 1941. During the next year or so he toured the war fronts of the Near East inspecting the supply problem, and with the same end in view, accompanied our ambassador, W. Averell Harriman, to Russia. In 1942, he was appointed commander of the Allied air forces in the Western Pacific, and later the same year headed the Caribbean Defense Command. He received the Distinguished Service Medal in 1942. He was retired with the permanent rank of major general in 1945, but returned to active duty for a year with the rank of lieutenant general, finally retiring in 1946.

Bretton Woods (*brĕt'ŭn wŏŏdz*), a resort community, part of Carroll Township, N.H. The place gained prominence when the United Nations (*q.v.*) Monetary and Financial Conference met there (July 1944) to lay the foundation for an International Monetary Fund and an International Bank for Reconstruction and Development supposed to stabilize currencies and prevent post-World War II depression. The agreement was ratified by the U.S. Congress in the summer of 1945. See *International Bank; International Monetary Fund.*

Breuer (*broi'ĕr*), MARCEL LAJOS, architect and educator, born in Pecs, Hungary, May 21, 1902. He received his architectural education in Hungary and Germany, receiving his M.A. from the Bauhaus, Weimar, Germany. Breuer is the inventor of tubular steel furniture (1925), and plywood furniture (1935). His reputation in the field of architecture today is equal to that of Walter Gropius and Frank Lloyd Wright. His first important work was his design of the Harnischmacher house in Wiesbaden, Germany, in 1932. He settled in the U.S. in 1937 when he became an associate professor of architecture at Harvard Univ. As early as 1928, Breuer was experimenting with designs for low-cost housing projects in Germany.

Breughel (*brû'gĕl*), BRUEGEL, or BRUEGHEL, a family of Flemish painters. Pieter Breughel, the Elder, known as "Peasant Breughel," born near Breda, in The Netherlands, *ca.* 1525; died at Brussels in 1569. A pupil of Pieter Coeck van Alst, he went to Antwerp, where he had contact with publishers and engravers, and did mostly graphic work. In 1551 he became a master in the guild of St. Luks, traveling to Italy soon afterward. Breughel maintained his connection with his former teacher, Van Alst, and married his daughter, with whom, in 1563, he settled in Brussels. It is interesting to note that the rich "oeuvre" of Breughel's paintings was created during the last 10 years of his life, for the first authentic canvas by him dates only from 1558; before this time Breughel worked as an engraver and draftsman. However, in these last 10 years he unfolded all the richness of his art, which was definitely based on the work of Hieronymus Bosch (*q.v.*). Like the latter he had a preference for the eerie, for the mysterious, as well as for depicting all the pleasures of rural life. Toward the end of his life, he concentrated on depicting only a few figures, filling the canvas in simple greatness, and no longer stressed grotesque, over-populous scenes. Among his religious paintings, "Adoration of the Kings," "Babel's Tower," and "The Slaughter of the Innocents" are as rich and great as are his peasant scenes, such as the "Wedding Dance," "Playing Children," and "Harvest"; while his early canvas, "Proverbs," with all its mysterious creatures, allusions, etc., shows his close dependence on Bosch. Paintings like "The Blind," or "Hunters in the Snow" are examples of his later development, his trend toward monumental simplicity, and show an extremely modern feeling for space and mood. As a painter of peasant genre scenes, he was of great influence on the Flemish 17th-century artists Teniers and Brouwer.

For pictures by Pieter Breughel, the Elder, see *Dance;* and color plate, *Great Paintings I,* in Volume XII.

His two sons, PIETER BREUGHEL, the younger (1564-1637), and JAN BREUGHEL (1569-1625), are also well-known painters. The first was known as "Hell Breughel," because of his preference for depicting scenes with devils in hellish surroundings; the latter was referred to as "Velvet Breughel," because of the soft velvet with which he dressed his figures. Jan Breughel also did very fine landscapes and flowers, and worked frequently with Peter Paul Rubens (*q.v.*), framing his madonnas and religious scenes with delicate flower garlands.

Breviary (*brē'vĭ-ĕr-ȳ*), the book which contains the ordinary and daily services of the Roman Catholic Church. The contents of the Breviary include all of the services except those for funerals, baptisms, and other special occasions, which are in the Ritual or Pontifical, and those used in the celebration of the Eucharist, which are in the Missal. It is divided into separate parts for winter, spring, summer, and fall.

Brewer (*brōō'ĕr*), DAVID JOSIAH, jurist, born in Asia Minor, June 20, 1837; died Mar. 28, 1910.

ARISTIDE BRIAND

After holding various judicial positions, he was appointed associate justice of the U.S. Supreme Court in 1889.

Brewing (*broo'ing*), the process of making beer, ale, or other fermented beverages. The term is applied to the extracting of wort or any saccharine substance from grain. Three raw materials, hops, barley, and water, are used in the process.

In the U.S. the brewing business is now a prolific source of revenue, paying large Federal, state, and local government taxes. Nearly one-third of the grains used in the brewing process is returned to farmers as concentrated protein-rich feed for livestock. Recovery of these grains is estimated at nearly 60 pounds per barrel of beer. In addition, the residual quantities of brewer's yeast, rich in B-complex vitamins, are dried to kill the yeast cells and then fed to poultry and animals as a feed enrichment, as well as being used to enrich human food and in pharmaceutical preparations. See *Beer*.

Brewster (*broo'stẽr*), SIR DAVID, physicist, born at Jedburgh, Scotland, Dec. 11, 1781; died Feb. 10, 1868. In 1808 he became editor of the *Edinburgh Magazine*. In 1815 he was made Fellow of the Royal Society, and in 1818 received the Rumford gold and silver medal for his work in the polarization of light. In 1832 he was knighted, and Edinburgh Univ. made him its principal in 1859. He rediscovered the kaleidoscope, improved the stereoscope, and succeeded in introducing the dioptric system in British lighthouses. His "Letters on Natural Magic" was addressed to Sir Walter Scott. In 1831 appeared his "Treatise on Optics." "More Worlds Than One" came out in 1854, and in 1855, he published "Memoirs of the Life of Sir Isaac Newton."

Brewster, WILLIAM, pioneer, born at Scrooby, England, in 1560; died Apr. 10, 1644. He studied at Cambridge Univ. and entered the public service. For a time he was Secretary of State to Queen Elizabeth, with whom he visited in Holland. On returning to England he left the established church and was imprisoned in 1607. He came to America on the first voyage made by the *Mayflower*. His descendants include many esteemed families of what is now known as New England.

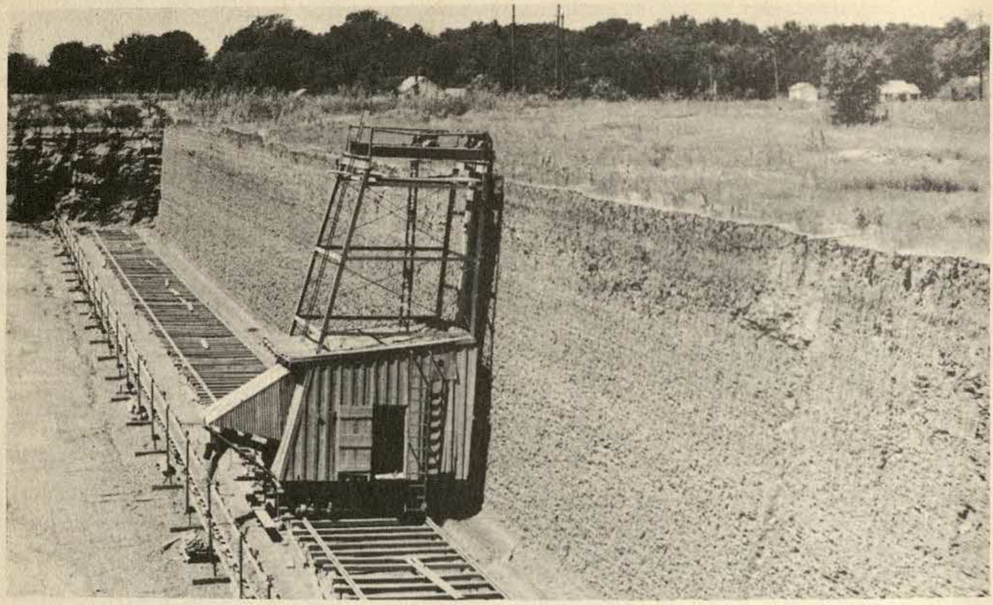
Briand (*brē-än'*), ARISTIDE, statesman, born in France in 1863. A successful lawyer and publicist, he entered politics and, in 1909, was appointed premier for the first time. After his resignation in 1911, he held important positions in several cabinets and the premiership again several times. He advocated a United States of Europe to heal the bitterness among nations after World War I, promoted the Kellogg-Briand Treaty designed to outlaw war, and was awarded the Nobel Peace Prize (1926). He died in 1932.

Briar (*brī'ẽr*) or BRIER, a southern European tree heath, the root of which is called French brier when used in the manufacture of pipes.

Bribery (*brīb'ẽr-ȳ*), a reward or valuable consideration given or accepted by anyone with a view to unlawfully influencing judgment or conduct in a public office or some other capacity. The charge of bribery is sometimes alleged against candidates for office, voters, and members of legislative bodies. Legislation with suitable penalties (in addition to removal from office) has been directed against it. It is a crime even if the party accepting the bribe does not pursue the course agreed upon.

Brice (*brīs*), FANNIE, actress, originally Fannie Borach, born in New York City, Oct. 29, 1891; died in Hollywood, Calif., May 29, 1951. Beginning her career by singing on street corners, she became known as the greatest comedienne of the 1920's and from 1910 to 1934 was the star of the noted Ziegfeld Follies. In 1928 she made her first motion picture; her latest film, "Ziegfeld Follies," was made in 1946. In 1932 she began her radio work. Starting as a vocalist, she soon switched to her favorite task, mimicry, creating the character of *Baby Snooks*.

Brick (*brik*), a molded and burned block of clay, forming a species of artificial stone. The name also applies to the unfinished product when in a molded plastic state, or when it has been dried and re-pressed, before being burned. Bricks were made at remote periods of antiquity by the Egyptians, Babylonians, Assyrians, and other people of ancient history. They mixed sand and straw with the clay and baked the bricks in the sun. When made in this way they are known as *adobe* brick. In cold countries freezing would soon dissolve these bricks, but they are valuable in warm and dry climates, and some of them have been preserved for more than 3,000 years. Many contain written characters, especially those of Babylon, to indicate the name of the reigning king, and are of priceless value in conveying historic facts to the present age. Brickmaking was introduced in Western Europe by the Romans in the year 44 A.D., and in England by the Anglo-Saxons under King Alfred, in 886. In the time of Henry VIII and Queen Elizabeth the manu-



Courtesy Kansas Independent Development Comm.

BRICK PRODUCTION

This clay-stripping machine cuts clay from its bed and prepares it to go to the kiln

facture became vastly important, the product entering largely into the construction of forts and public edifices. Kiln-baked brick are found in the larger ruins of ancient Babylon, where they were used to face or bind together walls of sundressed brick in a manner quite similar to the plan of constructing buildings with hard and soft brick at the present time. However, it appears that the kiln was not used much before the time of the higher Babylonian civilization. The people of Holland have long ranked as skilled manufacturers of brick. It is believed that in the early history of New York they may have brought large quantities of their product to America, which may still be found in the older part of New York City.

Various clays are used in brickmaking. They consist chiefly of silicates, the simplest, and are known as *fire clays.* Clays that contain iron burn red, while those containing no iron appear white, although the brick commonly manufactured vary greatly in color. The size of brick varies on account of the different clays used and the amount of heat applied in burning; those subjected to intense heat shrink somewhat. Commercial sizing of bricks, however, is done by dimensioning of the dies and molds. These dies and molds allow for shrinkage from firing and the finished product is standard size with rather small tolerances. The usual size employed in building is about 8 in. long, 3¾ in. wide, and 2¼ in. thick, while sidewalk brick are sometimes made 8 in. square and 2½ in. thick.

In making brick it is best to dig the clay in autumn and expose it to the influence of the rain and frost in order to break it up easily. It should be worked over a number of times and the brick may be molded and burned the following spring. On a small scale brick are made by hand, but for larger productions large machinery is used. The clay is mixed with sand and thoroughly worked in a pug mill, after which the material is put into molds and placed in a drying shed or in the sun. They are taken to the kiln to be burned when dry, which usually takes place in

DRY PRESS MACHINES FOR STANDARD FIREBRICK SHAPES

By exerting 2,500 lbs. pressure per sq. in., sturdy, closely knit, and compact brick is produced. The ground, dry clays are fed to the huge power press by gravity and the brick are moulded with little more than the natural moisture content of the clays

from 8 to 10 days. The kilns have flues or cavities for the insertion of fuel, and spaces for the passage of the fire and hot air to penetrate the brick stacked in regular order within. The burning is done by gas, wood, or coal, and varies from a few days to two weeks according to the method employed.

Brick pavements are constructed of *paving* bricks, which are made of a clay that contains a considerable amount of lime. The lime fuses in burning and causes the finished product to become very hard. In the market they are frequently called *vitrified* brick. The larger use of steel frames in constructing the tall buildings of modern times has caused brick to be employed extensively for filling the interior walls, though in some instances they have been replaced by cement. In many buildings, especially in the larger fireproof structures, *hollow* tiles are used for the inside walls.

Bricker (*brĭk′ẽr*), JOHN W., U.S. Senator, born in Pleasant Township, Ohio, Sept. 6, 1893. He taught school for a year and then entered Ohio State Univ., where he received B.A. and LL.B. degrees. After entering the practice of law (1917), he worked continuously (1920-32) in Republican politics in Ohio, being elected attorney general in 1932. He was elected governor of Ohio in 1938 and was re-elected in 1940 and 1942. In 1944 he was named Republican nominee for the Vice-Presidency of the U.S. as the running mate of Thomas E. Dewey (*q.v.*). He was elected U.S. Senator from Ohio in 1945. Senator Bricker in 1953 was the author of a constitutional amendment which stimulated nationwide debate. The amendment, which proposed curbs on the traditional treaty-making power of the President, was defeated, however, in the Senate in February 1954.

COVERED BRIDGE AT STOWE, VT.

Courtesy Standard Oil Co. (N.J.)

Bricklaying (*brĭk′lā-ĭng*), the art of building with brick. The principal implements of a bricklayer are a *trowel,* for spreading mortar; a *hammer,* for dividing and driving brick; a *plumb line,* for carrying the wall up perpendicularly; a *level,* for maintaining longitudinal levels; a *rod* 5 or 10 ft. long, for taking measurements; and a *hod,* for carrying brick or mortar to the workmen. The mortar is made of lime and sand. A solid foundation is an essential feature of a brick building, since a faulty foundation will cause the structure to settle unequally and, eventually, to crack. Bricklaying has been mostly superseded by the use of newer materials, such as steel, stone, and concrete.

Bride (*brīd*), SAINT, also known as BRIGID or BRIDGET, patron saint of Ireland, born in Faughart, Ireland, *ca.* 451; died in Kildare, Ireland, Feb. 1, 525. The daughter of an Ulster prince and his bondmaid, she distributed many of her father's goods among the poor. Later, he tried to sell her to the king of Ulster, who, impressed with her piety and charity, freed her from parental control. She founded a church and monastery at Kildare. St. Bride became a favorite saint throughout the British Isles; her name appears as an element in many English place names, such as Kirkbride, Bridewell, etc. Her feast day is Feb. 1.

Bridewell (*brīd′wĕl*), a parish located in central London, England, between Fleet St. and the Thames River. The name Bridewell is usually associated with the prison which stood on its site until 1864. The prison was founded on the same site as a favorite palace of Henry VIII, which Edward VI gave to the city of London in 1553.

Bridge (*brĭj*), a card game, adapted from whist which probably developed in England in the 17th century. About 1900, a game called bridge whist was developed; later developments were *auction* and *contract* bridge.

Both auction and contract bridge are played by four persons, teamed in pairs, as opposing partners. Following the distribution of the cards (13 to each player), the players bid for the privilege of naming the trump suit (or of playing in "no-trump"). Points are scored for all tricks over six. The basic six tricks are called a "book." Trick score counts toward a game; the team winning the first two games wins a rubber, for which a bonus is added.

The difference between auction and contract bridge is in the bidding and scoring. In auction, the partners attempt to get the bid as cheaply as possible, since every odd trick made, regardless of the number bid, counts toward game. In contract bridge, more emphasis is placed on skill in bidding, since tricks toward game count only if contracted for, over-tricks being added to honor score. Different rules govern the methods of scoring honors in the two games.

Bridge, a structure constructed for the purpose of carrying a highway, railway, footpath, aqueduct, or pipeline over a waterway, valley, road or other obstruction while maintaining free passage underneath. The most common types are: (*1*) the beam, which may be timber or reinforced concrete, or an I-shaped section of metal, in one piece or built up of plates and angles to form a girder; (*2*) the truss, consisting of long slender members of timber or metal joined to form a structure that is subdivided into distortion-resisting triangles; (*3*) the arch, which is sprung between two abutments, and may be built of any rigid material; and (*4*) the suspension bridge, with a main flexible carrying member of high tensile strength. The spans of beam and truss bridges may be (*a*) simple, where the structure rests on two supports; (*b*) cantilever, where the structure extends beyond its supports, and (*c*) continuous, where an uninterrupted length of structure rests on more than two supports. When it is not feasible to erect a fixed or high-level bridge over a waterway with sufficient underclearance, one of various types of movable bridges may be selected. Four methods of joining the elements of metal bridge structures are available—pinning, riveting, bolting, and welding. Timber is rarely used at present for permanent bridges; and brick and stone have been displaced by concrete. Cast iron and wrought iron were used for the first metal bridges. They were succeeded by carbon steel and various alloy steels. In recent years several girder, arch, and movable bridges have been built of aluminum.

EVOLUTION OF BRIDGES

The first bridges were formed by nature. There were the fallen log, the arch formed by erosion, or the vine stretching from tree to tree. The first bridgebuilder felled a tree to drop across the chasm. Where timber was lacking in northern climates, man used flat stones. In warm regions, he plaited creepers into ropes to form a cable crossing. The cantilever bridge was devised in India, using planks of wood, counterweighted by stones. The arch was born in Mesopotamia about 4000 B.C. and developed slowly. It first appeared in China after A.D. 100.

The Romans, in their role of conquering nation, built many temporary wooden bridges of various types. Trajan, A.D. 104, built a bridge over the Danube River of timber arches, resting on 20 stone piers, 150 ft. high and 170 ft. apart. This span length was not exceeded for 12 centuries. Many stone arches built by the Romans have endured to today. Of eight stone bridges erected over the Tiber between 200 B.C. and A.D. 260, six survive. Examples of Roman arches still stand in Spain and France.

In the Middle Ages, the art of bridgebuilding was preserved in orders of the church. A monk built the Old London Bridge (1176-1209). It consisted of 19 pointed arches with a drawbridge in one span. It served for over 600 years, carrying shops and dwellings. A granite arch at Trezzo, Italy, built in 1377, had a span of 251 ft., which was not exceeded for 500 years.

The Renaissance saw the invention of the truss in the 16th century and advances in theory, technical skill, and labor-saving construction machines. During this period, many celebrated masonry bridges were built that are in use today.

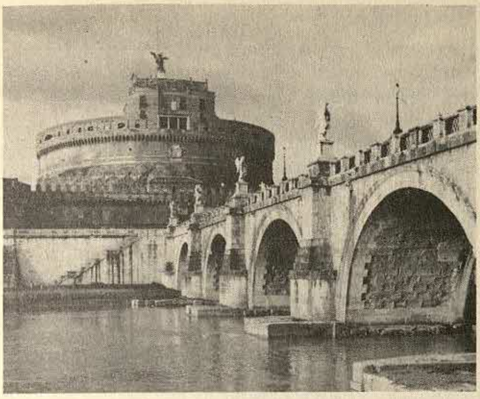
In the 18th century, scientific analysis was applied to bridge design, and the first engineering school was established in France.

Timber bridges appeared in all forested countries. They were usually a combination of arches and trusses and were roofed to protect the structures from the elements. Many truss forms were invented, combining the use of iron and timber.

The first iron bridge, of 100-ft. span, was built in England in 1779. Iron chain cables were used for a 70-ft. suspension bridge in 1741. The Menai Straits Bridge in Wales, a suspension type with wrought-iron chain cables, was built (1819-26) with a record-breaking span of 580 ft. About 1855, wrought iron replaced cast iron, affording greater safety; it was, in turn, replaced by steel about 20 years later. The first all-steel bridge was built in 1878. The advent of steel and scientific analysis led to the creation of new forms of bridges, of bolder design, combining greater strength and beauty.

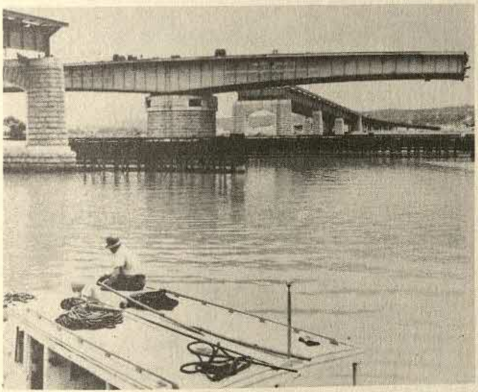
MODERN BRIDGES

Steel Arch Bridges: The main carrying member of an arch bridge is a rigid arc-shaped member bowed upwards. The loads place the arch rib in compression and the ends thrust outward. This thrust is resisted by rock foundations, by masonry abutments, or by tying the two ends of the arch together. The arch rib may have three hinges, one at the top center and one at each end. The hinge at the top center may be omitted, making the arch two-hinged. The end hinges may also be omitted, making the arch fixed. Masonry arches are almost always fixed. Metal arch ribs may be curved solid web-plate girders or may be in the form of a truss. The famous Eads Bridge over the Mississippi River at St. Louis, with three spans of 502 ft., 520 ft., and 502 ft., completed in 1874, is a pioneer arch type. It embodied many innovations in bridge construction: pneumatic caissons for large piers, large-scale use of alloy steel, hollow tubular chord members, and major use of the cantilever method of erection. The Victoria



PONTE SANT' ANGELO, ROME, ITALY

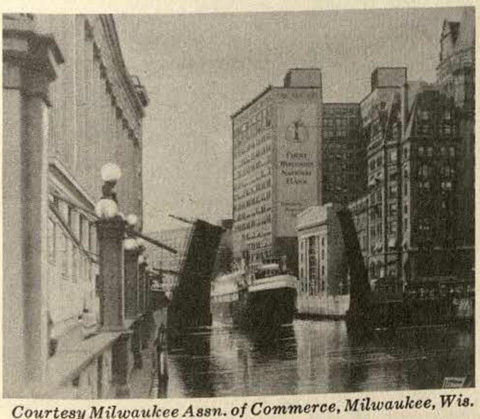
A stone-arch bridge, originally called Pons Aelius, built by the Romans A.D. 134, with the Castel Sant' Angelo, also called Hadrian's Mausoleum, in the background



Courtesy Engineering News-Record

SOUTH CAPITOL ST. BRIDGE

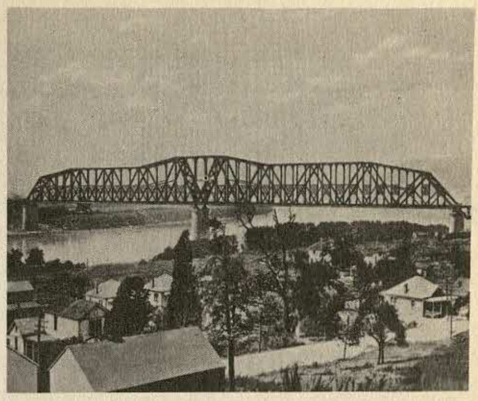
This plate-girder, swing-span highway bridge across the Potomac River, at Washington, D.C., was completed in 1949. It has a span of 386 ft. and a total length of 3,250 ft.



Courtesy Milwaukee Assn. of Commerce, Milwaukee, Wis.

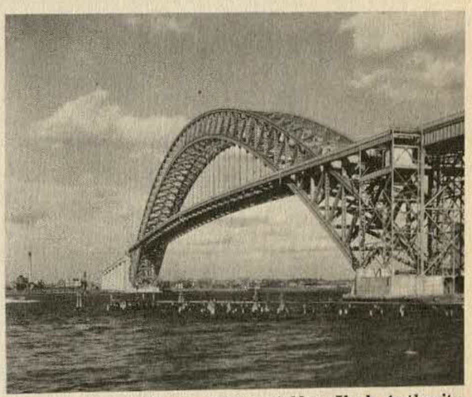
WISCONSIN AVE. BRIDGE, MILWAUKEE

This two-leafed bascule bridge across the Milwaukee River opens to permit passage of Lake Michigan shipping



SCIOTOVILLE BRIDGE

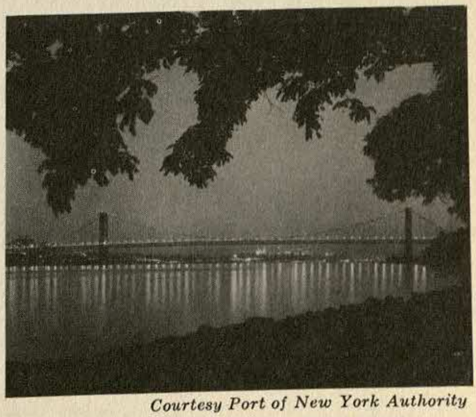
This continuous-truss railroad bridge across the Ohio River, completed in 1917, has two main spans of 775 ft. each and a total length of 3,435 ft.



Courtesy Port of New York Authority

BAYONNE BRIDGE, NEW JERSEY

This steel-arch railroad bridge, across Kill van Kull, was completed in 1931. With a span of 1,652 ft. and a total length of 8,100 ft., it is the longest bridge of its type in the world



Courtesy Port of New York Authority

GEORGE WASHINGTON BRIDGE, NEW YORK

This suspension bridge, completed in 1931, has a span of 3,500 ft. and a total length of 8,716 ft. The lower-level roadway was completed in 1962

MACKINAC BRIDGE, MICHIGAN

This suspension bridge across Mackinac Straits, completed in 1957, has a center span of 3,800 ft., side spans of 1,800 ft. each, and a total length of 28,280 ft. It is the world's longest suspension bridge from anchorage to anchorage

Falls Bridge over the Zambesi River in Rhodesia, completed in 1907, with a span of 650 ft., was erected from a cableway. The Henry Hudson Bridge, span 800 ft., designed by D. B. Steinman, and completed in 1936, is a fixed, plate girder arch. Notable arch bridges are the Hell Gate, New York City (977.5 ft.), 1917; Birchenough, Southeastern Rhodesia (1,080 ft.), 1935; Sydney Harbour, Australia (1,650 ft.), 1932, and Bayonne, N.J. (1,652 ft.), 1931.

Suspension Bridges: The main carrying members of a suspension bridge are the towers, anchorages, and cables. Light girders or trusses, which carry the floor, are suspended from the cables and serve to stiffen the bridge against distortion from heavy loads. In large bridges, cables are usually made of parallel high-strength wire or twisted wire rope strands, but many cables in Europe are of the eyebar or chain type. In a self-anchored bridge, the anchorages are omitted and the cables are attached to the ends of the stiffening girders. The father of the modern suspension bridge was John A. Roebling, who developed the air-stringing method of building parallel wire cables. His greatest achievement was the 1,595.5-ft. Brooklyn Bridge, in New York City, which was finished by his son in 1883 (see *Roebling, Washington Augustus*). Suspension bridges of longer spans are: Williamsburg, New York City (1,600 ft.), 1903; Bear Mountain, N.Y. (1,632 ft.), 1924; Benjamin Franklin, Philadelphia (1,750 ft.), 1926; Ambassador, Detroit (1,850 ft.), 1929; George Washington, New York City (3,500 ft.), 1931; and Golden Gate, San Francisco (4,200 ft.), 1937. The Mackinac Bridge, Mich., has the second-longest span (3,800 ft.) and was completed in 1957.

Courtesy United Press

TAPPAN ZEE BRIDGE, NEW YORK

This cantilever bridge across the Hudson River, at South Nyack-Tarrytown, forms a link in the New York Thruway. Completed in 1955, it has a center span of 1,200 ft., two side spans of 600 ft. each, and a total length of 2.8 m. The piers are of hollow concrete

Cantilever Bridges: A basic cantilever bridge has four piers, forming three openings. The end openings are spanned by trusses that project, or cantilever, into the center opening. A short span is hung between the ends of the cantilevers. Construction over the center opening need not obstruct navigation, as falsework is not required. The first modern cantilever bridge was built in 1867 at Hassfurt, Germany, with a center span of 425 ft. The most famous is the colossal Firth of Forth Bridge in Scotland, with two main spans of 1,700 ft. each, which was built in 1890. This span record was held for over 25 years, until the Quebec Bridge, with a span of 1,800 ft., was completed in 1917. The Carquinez Strait Bridge, in California, has two main spans of 1,100 ft. each and was completed in 1927. Other notable cantilever bridges are the Queensboro, New York City, with two cantilever spans of 1,182 ft. and 984 ft., 1906; the cantilever portion (1,400 ft.) of the San Francisco-Oakland Bay Bridge, 1936; the Howrah, India (1,500 ft.), 1943; and the Greater New Orleans (1,575 ft.), 1958. For an illustration of the San Francisco bridge, see *San Francisco*.

Continuous Bridges: A continuous bridge is a beam, girder, or truss, without hinges or other interruption of continuity, that rests on more than two supports. This type of construction provides economy of material and increased rigidity over separate simple spans. Notable examples of truss-type continuous bridges are Sciotoville, Ohio (775 ft.), 1917; Duisburg, Germany (839 ft.), 1935, which was destroyed in 1945; Dubuque, Iowa (845 ft.), 1943; Shawneetown, Ill. (825 ft.), 1956; and Kingston-Rhinecliff, N.Y. (800 ft.), 1956. Notable examples of plate girder-type continuous bridges are Bonn-Beuel, Germany (643 ft.), 1949; Düsseldorf-Neuss, Germany (676 ft.), 1951; and Belgrade, Yugoslavia (856 ft.), 1956. The longest plate-girder span in America is the bridge over the Quinnipiac River, New Haven, Conn., with a 387-ft. span, completed in 1957.

Simple Span Bridges: The longest-span simple bridges of truss type are: Metropolis, Ill. (720 ft.), 1917; Tanana River, Alaska (700 ft.), 1922; Paducah, Ky. (716 ft.), 1929; and a railroad bridge at St. Louis, Mo. (668 ft.), 1911. The longest simple girder span is part of a lift bridge over the Harlem River in New York City, completed in 1941, with a span of 300 ft.

Movable Bridges: A movable bridge is one that may be moved to provide greater clearance for ships. The main types are (*1*) swing, turning about a vertical axis; (2) bascule, swinging upward about a horizontal axis; and (*3*) lift, moving vertically. In rare use are retractile, moving longitudinally; transporter, carrying a moving platform suspended from an overhead high-level fixed bridge; and pontoon, arranged to retract or swing aside. The longest movable bridges are: *swing,* Ft. Madison, Iowa, over the Mississippi River (525 ft.), 1927; *double-leaf bascule,* Sault Ste. Marie, Mich. (336 ft.), 1914; *single-leaf bascule,* 16th St., Chicago (260 ft.), 1919; *vertical lift,* Cape Cod Canal, Mass. (544 ft.), 1935; and *transporter,* the Sky Ride (1,850 ft.), built for the Chicago World's Fair, 1933.

Masonry and Concrete Bridges: The longest stone-arch bridges are the bridge at Plauen, Germany (295 ft.), 1903, and the Pont Adolphe in Luxemburg (278 ft.), 1903. The longest bridge of this type in the U.S. is Cabin John, Washington, D.C. (220 ft.), 1859. Since 1903, masonry has been replaced by concrete, with great increases in span length. The longest concrete arches in the world are Plougastel, Brest, France (612 ft.), 1929; Esla, Spain (645 ft.), 1940; Sando, Sweden (866 ft.), 1943; and Antas River, Brazil (612 ft.), 1953. The longest concrete arch in the U.S. is the center span (425 ft.) of the George Westinghouse Bridge at Pittsburgh, Pa., 1931. See also *Aqueduct; Road; Viaduct.*

Bridgeport (*brĭj′pōrt*), a city and port of entry in southwestern Connecticut, seat of Fairfield County, located on Long Island Sound at the mouth of the Pequonnock River, 17 m. s.w. of New Haven. It is served by the New York, New Haven and Hartford R.R., by harbor facilities, and by a ferry connection with Port Jefferson, Long Island, N.Y., for part of the year. The Municipal Airport is located 3.5 m. from the city's center. Saint Augustine's Cathedral (Roman Catholic) is located in Bridgeport. Among the city's park and playground areas (covering 1,200 acres) are Seaside Park, with a frontage of 10,000 ft. on Long Island Sound, and Beardsley Park, on the Pequonnock River, noted for its zoological gardens and greenhouses. The first section of the present land of Seaside Park was given to Bridgeport in 1865 by P. T. Barnum (*q.v.*), a resident of the city for many years.

Bridgeport is primarily a manufacturing city, and, because of its geographic location, transportation facilities, and accessibility to raw materials, it ranks first among Connecticut's cities in industrial production. Among its manufactures are ammunition and firearms, automatic machinery, nuts, bolts, and screws, brass products, brake linings, corsets, chains, electrical and pharmaceutical supplies, phonograph records, scissors, typewriters, and steel products. Bridgeport (value added by manufacture, 1958, $382,814,000) is the center of the Bridgeport standard metropolitan statistical area (pop., 1960, 334,576), including parts of Fairfield and New Haven counties. The area's value added in 1958 was $570,625,000.

The city's public and parochial schools enroll *ca.* 23,500 and 7,500 students, respectively. Its institutions of higher learning are the Univ. of Bridgeport and Bridgeport Engineering Inst. Cultural facilities include the public library, Wonder Workshop Junior Museum, and Barnum Museum. Klein Memorial Auditorium serves as a center for community activities.

Bridgeport was incorporated as a city in 1836 and has a mayor-council form of government. The mayor and council members are elected for two-year terms.

The Bridgeport area, originally called Pequonnock, was first settled in 1639. In 1694 it was granted a separate government as Fairfield Village, later changed to Stratfield Village (1701). In 1800 the village of Newfield (on the west shore of the Pequonnock) was incorporated as the Borough of Bridgeport and, in 1821, together with Stratfield Village, was incorporated as the town of Bridgeport. The railroad reached the city in the 1840's, bringing an increase in manufacturing and industry. Its period of greatest industrial expansion was in World War I, when it became known as the "arsenal of democracy." During World War II the city's industries were awarded more Army-Navy "E's" per capita than the industries of any other war center in the nation.

The population increased from 4,570 in 1840 to 48,866 in 1890 and to 102,054 in 1910. In 1940 its population was 147,121; in 1950, 158,709; in 1960, 156,748.

Bridges (*brĭj′ĭz*), ROBERT SEYMOUR, poet, born in Walmer, England, Oct. 23, 1844; died in Chilswell, North Berkshire, April 21, 1930. Educated at Eton and Oxford for a medical career, he practiced in London hospitals until 1882, when he entered upon a literary career, writing eight plays between 1885 and 1894. In 1890 "Shorter Poems," a collection of lyrics, was published, and in 1913 Bridges was made poet laureate of England. A popular anthology, "The Spirit of Man," appeared in 1916, and his last great poetic work, "The Testament of Beauty," was published in 1929. In addition to writing poetry, he was deeply interested in the development of English prose and verse. He published "Milton's Prosody" (1887) and "John Keats, a Critical Essay" (1895). Literary circles praise him for bringing the poems of Gerard Manley Hopkins, an English Jesuit priest (1844-89)—which enhanced

English poetry and showed innovation in rhythm—to the attention of the public in 1918.

Bridgeton (*brĭj′tŭn*), county seat of Cumberland County, New Jersey, on Cohansey Creek, 38 m. s. of Philadelphia. It is conveniently located on the Penna.-Reading Seashore and the New Jersey Central R.R.'s, and is a thriving business center. Its manufactories produce clothing, bottles, trucks, machinery, and woolen goods, and include rolling mills and tanneries. There are numerous beautiful churches and educational institutions, including the West Jersey Acad., South Jersey Inst., and Ivy Hall Sem. The city was settled before the Revolution and was incorporated in 1864. Population, 1905, 13,624; in 1930, 15,699; in 1940, 15,992; in 1950, 18,378.

Bridgetown (*brĭj′town*), a city of the West Indies, capital of the island of Barbados. It is located on the western coast, along Carlisle Bay, and is the terminus of a railroad. The chief buildings include a hospital, the town hall, and the government building. It has several churches, including the Church of St. Mary and the Church of St. Michael, and in Trafalgar Square is a statue of Lord Nelson. It is fortified, having a well-equipped garrison. Bridgetown was originally called Indian Bridge. It was partly destroyed by fire in 1845. Population, over 30,000.

Bridgewater (*brĭj′wä-tẽr*), a town of Massachusetts, in Plymouth County, 26 m. s. of Boston, on the New York, New Haven & Hartford R.R. Among the chief industries are brickyards, a shoe factory, and machine shops. It is the seat of the Bridgewater Teacher's Coll., established in 1840. The first settlement was made on its site in 1645, when it was known as Nuncketest, and in 1656 it was incorporated as Bridgewater. Population, 1905, 6,754; in 1940, 8,902; in 1950, 9,512.

Bridgewater, a town of Nova Scotia, in Lunenburg County, 12 m. w. of Lunenburg. It is located at the head of the La Have estuary, and has the main offices of the Nova Scotia Central Ry. Its buildings include several schools and churches, and it has a good trade in merchandise. Population, *ca.* 3,500.

Bridgman (*brĭj′mạn*), LAURA DEWEY, famous blind deaf-mute, born in Hanover, N.H., Dec. 21, 1829; died in Boston, Mass., May 24, 1889. At the age of two years she became very sick and lost the senses of sight, hearing, and smell, and her sense of taste was impaired to some extent. Her education was intrusted to Dr. Samuel G. Howe, at Perkins Inst. for the Blind, in which she afterward became a teacher. She was taught by developing the sense of touch and acquired the use of the alphabet by raised letters, after which she learned to use a lead pencil. She studied arithmetic by handling objects, and geography by using relief maps, and became skillful in doing sewing and housework. After learning of the existence and character of God, she found much delight in reading her Bible. Sound vibrations were not perceptible by her ear, but her sense of touch was so delicate that she could perceive them; a strong beam of light made a slight impression on her right eye. She seemed to enjoy life, was cheerful and of a sociable disposition, and attained success in teaching others who were blind and deaf.

Brigandage (*brĭg′ạnd-ĭj*), the name applied to the system of robbery organized by gangs of highwaymen, who make their home in secluded places in the forests or among the mountains. Brigandage was at its height in the period of barbarism, when might was recognized as the only right, and those engaged in it practiced robbery upon wayfarers or held them for ransom. It is older than human history, dating back to times before civilization had its rise. The history of Greece accounts that heroes distinguished themselves by suppressing it, and Hercules rid the country of robbers who infested the caverns. In Germany the so-called robber barons practiced brigandage, and we have examples of it in British history in Robin Hood and Dick Turpin. In France the name *brigands* was first applied to the mercenaries who occupied Paris in 1358, when King John was imprisoned.

Brigandage is still practiced in semicivilized countries, or where the government does not exercise a vigorous policy in protecting the life and property of its citizens or those who may sojourn in the country. Regions not densely populated, even in highly civilized countries, are sometimes infested with brigands. We have examples of brigandage as late as 1901, when Ellen Stone was kidnaped in Macedonia and held for a ransom. She and her companion, Madame Tsilka, were detained about five months, until Feb. 6, 1902, when they were released at Strumitza, Turkey, on ransom payment. Jesse James (*q.v.*) and other brigands committed train and bank robberies in the Western section of the U.S. These crimes were committed usually in small towns or in regions not densely populated, and to escape arrest the robbers destroyed telegraph connection. John Dillinger and other 20th century robbers modernized these same techniques in the "gangster era" of the 1920's and thirties.

Briggs (*brĭgz*), CHARLES AUGUSTUS, clergyman, born in New York City, Jan. 15, 1841. He studied in the Univ. of Virginia and in Union Theological Sem., and took a three years' course at the Univ. of Berlin, Germany. On returning to America, he was called as pastor to the Presbyterian Church at Roselle, N.J., and subsequently was made professor of Hebrew in Union Theological Sem. He became celebrated partly on account of his teachings regarding scriptural doctrines at variance with his denomination, and was declared guilty of propagating views contrary to the standards of the Presbyterian Church and the Scriptures by a general assembly of the Presbyterian Church of North America, while in session at Washington, D.C., in 1893. He is the author of a number of publications, among them, "The Bible, the Church, and the Reason," "The Higher Criticism of the Hexateuch," "American Presbyterianism," "Messianic Prophecies," "The Messiah of the Gospels," and "Ethical Teachings of Jesus." He died June 8, 1913.

Briggs, LYMAN JAMES, physicist, born May 7, 1874; died in Washington, D.C., March 25, 1963. He was educated at the Michigan Agriculture Coll., the Univ. of Michigan, and Johns Hopkins Univ. From 1896 to 1920 he headed various divisions of the U.S. Dept. of Agriculture and conducted important biophysical experiments. In 1920 he was appointed chief of the division of mechanics and sound of the Bureau of Standards, and from 1933 until his retirement in 1945 he was its director. Briggs was codiscoverer of the earth-inductor compass, which was used by Charles A. Lindbergh (*q.v.*) on his transatlantic flight. As chairman of the Uranium Committee (predecessor of the Manhattan Project that developed the atomic bomb), he prepared the way for the growth of nuclear physics in the U.S.

Bright (*brīt*), JOHN, statesman and orator, born in Rochdale, England, Nov. 16, 1811; died there, March 27, 1889. The son of a Quaker, who was a cotton mill owner, he was elected to Parliament in 1843 and remained in government during most of the balance of his life. He was in the Gladstone cabinets in 1868-70, in 1873-74, and in 1880-82, until he resigned in protest against the British bombardment of forts in Alexandria, Egypt. Along with Richard Cobden (*q.v.*), he is remembered for his fight against the Corn Laws (*q.v.*) and for his general championship of the middle class. Among the principles he supported were free trade, parliamentary reform, a *laissez-faire* attitude toward industrialism, and Irish land reform. One of his most famous speeches was made in opposition to the Crimean War. He was considered a great English orator of his generation.

Brighton (*brī'tŭn*), a seaport on the English Channel, in Sussex County, England, 50 m. s. of London. It was made the summer residence of George IV, then Prince of Wales, in 1782, and has since been popular as a fashionable resort in the summer season, when about 30,000 visitors are here constantly. It is located on elevated cliffs and has many mineral springs. A promenade and drive over 3 m. long stretches between the city and the coast, one of the finest in Europe. It has beautiful edifices, gardens, and several colleges and institutions devoted to learning. The aquarium contains a notable collection of marine life. Although Brighton has some trade and manufactures, it is noted particularly as a center of art and education and as a seaside resort. Population, 1930, 142,746; in 1931, 147,427; in 1951, 156,440.

Bright's Disease (*brītz dĭz-ēz'*), a granular disease of the kidneys, so named because Robert Bright (1789-1858), an English physician, first made a diagnostic description of it. Its early symptoms consist of the secretion of urine containing a large amount of albumen and less specific gravity than natural, attended by pain in the loins, frequent urination, indigestion, and finally dropsy. It is a fatal disease, remedies having only a palliative effect. It is sometimes induced and always greatly aggravated by the use of alcoholic drinks. The most skillful treatment should be obtained on the appearance of the first symptoms.

Brillat-Savarin (*brē-yȧ'-sȧ-vȧr-ăn'*), ANTHELME, politician, writer, born in Belley, France, April 1, 1755; died in Paris, Feb. 2, 1826. His "*Physiologie du goût*" (1825) is a widely known culinary work.

Brimstone (*brĭm'stōn*). See *Sulfur*.

Brindisi (*brĭn'dĭ-zĭ*), a seaport in Italy, capital of Brindisi Province (area, 709 sq. m.; 1951 pop., 313,006), located on the Adriatic Sea, above the Strait of Otranto. A major shipping center, it exports wine, olive oil, and figs and processes food. Its notable buildings date from the Middle Ages. Known as Brundusium to the Romans, the city was the end of the Appian Way. Vergil died here in 19 B.C. An embarkation point for the crusaders, Brindisi declined after the discovery of sea routes around Africa, regaining importance with the opening of the Suez Canal. Population, 1951, 58,313.

Brink (*brĭngk*). See *Ten Brink, Bernhard.*

Brinton (*brĭn'tŭn*), DANIEL GARRISON, ethnologist, born in Thornbury, Pa., May 13, 1837; died July 31, 1899. He studied at Jefferson Medical Coll. and in Heidelberg, Germany, and was a surgeon in the Union Army during the Civil War. He published: "American Hero Myths," "The Myths of the New World," "Religions of Primitive Peoples," and "Library of Aboriginal American Literature."

Brisbane (*brĭz'băn*), the capital of Queensland, Australia, on the Brisbane River, about 25 m. from its mouth. It has an extensive harbor, and is the terminus of several railways and electric railroad lines. The river divides the city into two parts, known as North and South Brisbane, which are connected by the Victoria iron bridge. Among the chief buildings are the post office, two cathedrals, a university, and the state capitol, which was erected at a cost of about $1,000,000. Brisbane has four parks and many large stone business buildings. The city was founded in 1825 as a penal colony by Sir Thomas Brisbane. When Queensland was set off as a separate colony in 1859, it

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BRISBANE. CITY HALL

became the capital, and has since made rapid progress in commerce and wealth. Population, 1943, 370,000; in 1951, 450,300.

Brisbane, ARTHUR, editor, born in Buffalo, N.Y., Dec. 12, 1864; died in New York City, Dec. 25, 1936. He studied in Buffalo and Europe and became (1882) first a reporter, later London correspondent, for the New York *Sun*. Subsequently he served as managing editor (1890) of the New York *World* and as editor (1897-1921) of the New York *Evening Journal*. His editorial commentaries, appearing in the newspapers owned by William Randolph Hearst, earned him a national reputation. He was the author of "Mary Baker Eddy" (1908), "The Book of Today" (1923), and "Today and the Future Day" (1925).

Bristles (*brĭs′s′ls*), the coarse hairs of the hog and some other animals. They are glossy and stiff and are largest on the back, especially in the wild boar. Bristles are used for various purposes in manufacturing, in making brushes and saddlery, and to some extent by shoemakers. The best grade is obtained from swine grown in cold countries, where the bristles are longer and stiffer.

Bristol (*brĭs′tŭl*), a city of Connecticut, on the New York, New Haven & Hartford R.R. The principal manufactures include calculating machines, clocks and watches, ball bearings, fishing equipment, springs, castings, machine tools, brass, and metal and paper products. Population, 1940, 30,167; in 1950, 35,961.

Bristol, a borough of Pennsylvania, in Bucks County, 19 m. N.E. of Philadelphia, opposite Burlington, N.J. It is on the Delaware River and on the Pennsylvania R.R. The manufactures include leather, yarn, woolen and cotton goods, machinery, iron tools, and farm implements. It was settled as early as 1681, when it was called Buckingham, but was incorporated as Bristol in 1720. Population, 1900, 7,104; in 1950, 12,710.

Bristol, a port city of Rhode Island, county seat of Bristol County, 15 m. S.E. of Providence, on the New York, New Haven & Hartford R.R. It is situated on Narragansett Bay, which affords anchorage for large vessels. The harbor is safe and spacious. The manufactures include cotton, rubber, wire, shoes, and woolen goods. It is supposed that the Northmen built dwellings in the vicinity in A.D. 1000. In Bristol is Mt. Hope, where the famed Indian chief, King Philip, was killed. The first settlement was made on its site in 1675, and it was incorporated in 1680. Population, 1950, 10,335.

Bristol, a city of Sullivan County, Tennessee, and Washington County, Virginia, divided by the state line into two separate muncipalities, each with its own post office. It is a trading and farming center, contains railroad yards and produces paper, pulp, leather goods, mine cars, veneer, furniture, structural steel, and office machines. Bristol is the seat of Kings Coll. and two junior colleges for girls, Sullins and Virginia Intermont. First called Sapling Grove, it was the site of a fort built in 1771 and was chartered in 1856. Population, 1950, Bristol, Tenn., 16,771; combined population, 32,725.

Bristol, a city of England, located between Gloucestershire and Somersetshire, forming a county in itself. Bristol is built on both sides of the Avon River, which is crossed by the famous Clifton suspension bridge, 702 ft. long and 287 ft. above the low water mark. The city is prominent partly because of its mercantile business and partly on account of its early history. It was made a county in 1373 by Edward III. Henry VIII made it the seat of a bishopric in 1542. It is the seat of many notable buildings, among them a cathedral founded in 1142 and St. Mary Redcliffe Church, founded in the 12th century. The Univ. of Bristol has made great contributions to the advancement of atomic physics. Bristol's principal industry is engineering, in which aircraft engineering takes precedence. Much of the center of the city was destroyed by the Germans during the Blitz in 1940-41, and many of the old buildings were damaged or destroyed. Population, 1952 (est.), 445,000. See *Chinaware*.

Bristol Channel (*chăn′ẹl*), an inlet of the Atlantic Ocean. It serves to separate Wales from southwestern England and forms the estuary of the Severn. It is about 85 m. long, from 5 to 45 m. wide, and has a coast of about 225 m. It is remarkable for its high tides, or bores, which roll up the channel at a height of from 6 to 40 ft. Among the rivers that flow into it are the Severn, Avon, Wye, Axe, and Torridge. Lundy Island is near the entrance.

Bristow (*brĭs′tō*), BENJAMIN HELM, statesman, born in Elkton, Ky., June 20, 1832; died June 22, 1896. He attended Jefferson Coll. and practiced law in Kentucky. He served throughout the Civil War in the Union Army. In 1874 he was made Secretary of the Treasury and while in this office prosecuted the Whisky Ring. He was a candidate for the Republican nomination for President in 1876, and subsequently practiced law in New York City.

Britannia (*brĭ-tăn′ĭ-ȧ*), name given by Julius Caesar (100-44 B.C.) and other Roman writers to Great Britain. Today, that term is used as a personification of the British Empire, generally depicted as a stalwart young woman seated on a rock or on a globe. She usually holds a trident in her right hand, significant of her power over the seas; her left arm rests on a shield. This personification can be found on coins of the late Roman Empire.

British America (*brĭt′ĭsh ȧ-mĕr′ĭ-ḳȧ*), a term applied to that part of the British Commonwealth of Nations lying in or about the Western Hemisphere, including: Barbados, 166 sq. m., pop., 203,500; the Bahamas, 4,375 sq. m., pop., 68,846; Bermuda, 21 sq. m., pop., 33,500; British Guiana, 83,000 sq. m., pop., 373,598; British Honduras, 8,867 sq. m., pop., 59,287; Canada, 3,694,863 sq. m., pop., 11,506,655; Falkland Islands, 4,618 sq. m., pop., 2,721; Jamaica and Dependencies, 4,720 sq. m., pop., 1,250,199; Labrador, 110,000 sq. m., pop., 4,716; Leeward Islands, 422 sq. m., pop., 102,043; Newfoundland, 42,734 sq. m., pop., 300,000; Trinidad and Tobago, 1,862 sq. m., pop., 558,045; Windward Islands, 829 sq. m., pop., 250,418; totaling 4,334,477 sq. m., population, 14,713,528.

British Association for the Advancement of Science, an important society of Great Britain, established in 1831, whose object is to bring together eminent men to promote discovery and to diffuse the results of scientific research. Meetings have been held regularly each year. The membership of the society is about 5,500. It is supported by fees and annual dues. The income is larger than needed for actual support, and the surplus is used to promote investigations and scientific researches. The general meeting is presided over by the president, who delivers an annual address, after which meetings are held by the 10 sections, each having its own committee and presiding officer. The institution was organized by David Brewster (*q.v.*).

British Central Africa (*brĭt′ĭsh sĕn′trạl ăf′rĭ-ḳȧ*), the name, until 1907, of NYASALAND PROTECTORATE, a colonial possession of Great Britain in the east central part of Africa. It is bounded by Lake Nyasa, Portuguese East Africa, Tanganyika Territory and the Belgian Congo. The area is 37,354 sq. m. The surface is an elevated plateau, and the drainage is chiefly by the Shire River. It has an abundant rainfall, but the climate is not as healthful as that in the southern part of the country. Coffee, ivory, tobacco, and rubber are exported, and the chief imports are machinery and clothing. Blantyre, the largest town, has a population of 7,500, including about 100 Europeans. The protectorate was organized in 1891, and since then mining and farming have been introduced. In 1907 the name of the possession became Nyasaland Protectorate. Zomba, in the Shire region, is the seat of government. Population in 1940, 1,688,045.

British Columbia (*brĭt′ĭsh ḳō-lŭm′bĭ-ȧ*), the most westerly province of the Dominion of Canada, located between north lat. 49° and 60°. It is bounded on the north by Yukon and Mackenzie, east by Alberta, south by the U.S., and west by Alaska and the Pacific Ocean. Area, including Vancouver Island, 366,255 sq. m. Population, in 1941, 817,861. The coast line, including indentations, is about 12,000 m.

DESCRIPTION. The surface is mountainous, except in the northeastern part, which lies in the basin of the Mackenzie River. The mountains are outer fringes of the Cordilleras of North America, and the chains extend from southeast toward the northwest. Ranges of the Rocky Mts., which attain elevations ranging between 7,000 and 8,000 ft., trend through the western part, and between them and the coast is the comparatively low Coast Range. In the southeastern part, extending almost parallel to the principal chain of the Rocky Mts. on the line of Alberta, are the Gold Range and Selkirk Range. These mountains are the highest of those in the southern part, and their loftiest peaks, including Victoria, Leroy, and Dawson, have a height of from 9,000 to 11,600 ft. However, the highest summits are near the boundary of Alaska, where peaks of the Rocky Mts. rise to elevations which approximate 16,000 ft. These include Mt. Columbia, 14,000 ft.; Robson Peak, 13,700 ft., and Mt. Fairweather, 15,340 ft. Kicking Horse Pass, where the Canadian Pacific R.R. crosses the continental watershed, is 5,300 ft., and North Kootenay Pass is 6,550 ft. above the sea, while the mountains in the vicinity rise about 10,000 ft., and are covered with snow the entire year.

The Columbia drains the southeastern portion and crosses into the U.S., discharging into the Pacific. Through the south central part flows the Fraser, which rises near the line of Alberta, has a course toward the northwest, and then turns and flows almost due south to a point near the southern boundary, when it turns toward the west and discharges into the Strait of Georgia. In the northern part are the Taku, Stikine, Nass, and Skeena, which flow into the Pacific, the Liard, a tributary of the Mackenzie, and the Peace, which joins the Athabasca in Alberta. A number of lakes are distributed through the central part, all of them quite long and narrow. They include lakes Kootenay, Okanagan, Upper and Lower Arrow, Tacla, Babine, and Stuart. The sea coast is serrated and characterized by rugged cliffs and fiordlike estuaries. Near the mainland are a large number of islands, but all are small, except Vancouver and the Queen Charlotte Islands.

Climate and Soil. The climate is warmer than that of any other province in Canada, on account of the warm winds from the Pacific, and differs greatly from that of the cold region of the Atlantic coast. These winds modify the temperature noticeably in most of the province, but much of their moisture is given up when they come in contact with the higher altitudes of the Coast Range; hence the climate is less uniform in the eastern part and the rainfall is less copious. At Victoria, on Vancouver Island, the average temperature for January is 37° and for July 60°, and flowers bloom in the garden the entire year. The climate at Vancouver is practically the same, but in the interior the temperature varies from 40° below zero in winter to 100° above in midsummer. Rainfall is most abundant along the coast, ranging from 40 in. at Victoria to about 100 in. in the northern part, and diminishing toward the eastern part, where some localities do not have a sufficient amount to farm without irrigation. The rains and snows are heaviest on the western slopes, and the passes of the Gold Range and Selkirks have glaciers and snowfall to the depth of 30 ft. The Chinook winds make the Peace River valley pleasant and agriculture profitable in that section.

Flora and Fauna. The forest resources possess much value, and the trees are of a northern type. Dense forests are particularly abundant on the western slopes of the coast ranges, and a heavy growth of timber covers the eastern slopes, but the high plateau of the interior is almost treeless. The red cedar is widely distributed in large quantities, but the yellow cedar is confined to the northern region. Forests of spruce hemlock and hemlock abound. Other trees of commercial value are the oak, cherry, fir, yellow pine, yew, white maple, cottonwood, and arbor vitae. Fish are abundant in all the streams and off the coast, particularly the salmon, which is caught in large quantities at the mouth of the Fraser and other rivers. The wild animals include the moose, caribou, deer, big horn, bear, puma, and wildcat.

Minerals. Many valuable minerals are found in British Columbia. Gold was discovered in 1851 in the gravel along the rivers, from which it was obtained in paying quantities, but placer mining is not carried on to a great extent at present. The Kootenay district has been the chief source of gold, but mining has been developed in the mountains farther north. A fine grade of bituminous coal is obtained on Vancouver Island and in the Rocky Mts. Copper is mined in the southeastern portion. Other minerals include silver, zinc, copper, lead, and platinum.

Industries. Shipbuilding is the leading industry. Agriculture is growing steadily, both in the production of cereals and in the rearing of live stock. Many of the valleys are remarkable for their fertility, such as that of the lower Fraser, where farming has reached a high degree of development. The cereals grown include wheat, oats, barley, rye, and millet. Fruit is cultivated successfully, including most of the varieties common to the temperate latitudes. Irrigation has been introduced in the arid regions of the interior, but most of the farming is done where the rainfall is abundant, including some sections of the Peace River valley.

The salmon fishing and canning industry is an important enterprise. Many canneries are located on the coast and along the rivers, especially on the Nass, Skeena, and Fraser. The canneries of the Fraser River produce about one-half of the salmon packed in British Columbia, and those of the Skeena are second in importance. Fur sealing is an important enterprise. Other fisheries which are prolific as a source of wealth include those of the cod, grayfish, herring, halibut, and sturgeon.

Forest products represent the most important group of commodities in British Columbia. The timber resources are being utilized scientifically by new methods of cutting, and reforestation replenishes the supply of timber. Pulp and paper mills are comparatively new but thriving indus-

N.F.B. photo, courtesy Canadian Info. Service, N. Y.

BRITISH COLUMBIA

Typical range country with lake in background and herd being rounded up

Nat'l. Film Bd. photo, courtesy Canadian Information Service, N. Y.

SALMON FISHING IN BRITISH COLUMBIA

Siwash Indian fishermen haul in net

tries. The Douglas fir, or Oregon pine, yields vast quantities of choice building material. Many specimens of this tree have a diameter ranging from 10 to 18 ft. and a height of 300 ft. It is exceeded in size by the cedars, whose diameters reach 20 ft. in some individual specimens. However, both furnish a valuable grade of lumber. Other varieties used in lumbering include the cypress, hemlock, yew, and yellow pine. Vast quantities of timber are exported to Europe, Africa, and South America.

SPRUCE LOGGING IN BRITISH COLUMBIA

Nat'l. Film Bd. photo, courtesy Canadian Information Service, N. Y.

Many of the rivers are navigable and furnish important transportation facilities to carry trade with interior points. Some of the lakes, though not connected with the ocean by navigable streams, are used in transporting locally by steamboat. The province has *ca.* 3,650 m. of railway within its borders. The Canadian Pacific Ry. has a transcontinental line through the southern portion with the terminus at Vancouver, whence traffic is carried by steamer to Victoria, which has railroad facilities by lines on Vancouver Island. The line of the Canadian National Ry. passes through the central part, with the terminus at Vancouver and Prince Rupert, near the mouth of the Skeena River. Vancouver, Victoria, New Westminster, Prince Rupert, and Ladysmith are among the ports. Vancouver and Victoria are connected with the rest of Canada by the Trans-Canada Airways. In addition, there is adequate intraprovincial air service.

GOVERNMENT. The executive branch of government is vested in a lieutenant-governor, appointed by the Governor-General-in-Council. He is assisted by an executive council of eight members, who are chosen from the legislature, and to which they are responsible. The legislative authority is vested in a single chamber of 48 members elected by the people. The Assembly is elected for a period of five years; the members must be British subjects and they must have resided in their respective provinces for a period of six months. Six senators, appointed for life, and 16 members of the House of Commons, elected for a term not to exceed five years, represent the province in the federal houses. The public-school system, established in 1872, includes elementary, junior-high, and high schools, all of which are free and nondenominational. Attendance is compulsory for children between the ages of 7 and 15, and correspondence courses are provided for those unable to attend the regular schools. The Univ. of British Columbia is at Point Grey, a suburb of Vancouver. Teachers' training colleges are in Victoria and Vancouver.

POPULATION. The inhabitants of British Columbia are largely (66 per cent) of British extraction. Indians in the province number *ca.* 28,500. Prior to World War II immigration of Japanese and other Orientals to British Columbia was heavy, but it has since declined. Victoria, the capital, is located on Vancouver Island. Other leading cities are Vancouver, New Westminster, Nanaimo, Trail, Penticton, Prince Rupert, and Prince George. Population, 1961, 1,629,082.

HISTORY. British Columbia was first sighted by the Spaniard Juan Pérez, who sailed north along the coast in 1774. In 1778 Capt. James Cook reached Nootka Sound, where, in 1788, the English fur-trader John Meares established a post. Spanish-English rivalry for the region was settled by the Nootka Convention (1790), which favored Great Britain. George Vancouver explored the coast in 1792-94, and Sir Alexander Mackenzie penetrated the region by foot in 1793. In the early part of the 19th century, English fur traders of the North West Co. and the Hudson's Bay Co., which merged in 1821, established posts, and the region was ruled by the fur trade company. In 1843 Victoria was founded, and in 1849 Vancouver Island became a crown colony. Meanwhile, Americans, settling in the Columbia River valley, urged the ousting of the British below 54°40′ N. lat., which led to the 1844 campaign slogan of "Fifty-four forty or fight." The boundary between the U.S. and British regions was settled at 49° N. lat. in 1846, but controversy over this settlement led to the San Juan Boundary Dispute (see *San Juan Islands*). The British Columbia region was made a colony of Great Britain in 1858 and was combined with Vancouver Island in 1866. In 1871 British Columbia became a province of Canada. Gold rushes, beginning in 1858, brought settlers to the region, and the arrival of the Canadian Pacific Ry. at Vancouver in 1885 spurred further immigration. In the first half of the 20th century, further rail connections and increased mining interests helped open up the northern and eastern sections. The value of mineral production rose from $54,923,802 in 1944 to $186,261,646 in 1960.

British Commonwealth of Nations, officially (since 1949) the Commonwealth of Nations, the all-embracing designation for the communities comprising the British Empire. The form of government in each territory is determined by its

	BRITISH COMMONWEALTH OF NATIONS	AREA (*sq. miles*)	POPULATION* (*1,000*)
	GREAT BRITAIN & N. IRELAND	94,275	52,775
EUROPE	Gibraltar (C)	2½	26
	Malta (C)	122	329
ASIA	Aden (C and P)	111,080	810
	Brunei[1] (PS)	2,226	84
	Ceylon (M)	25,332	9,625
	Cyprus, Republic of (M)	3,572	565
	Hong Kong (C)	391	3,128
	India, Republic of[2] (M)	1,259,797	436,424
	Malaya, Federation of[1] (M)	50,690	6,909
	Maldive Islands (PS)	115	90
	North Borneo[1] (C)	29,388	454
	Pakistan, Republic of (M)	364,737	93,812
	Sarawak[1] (C)	47,500	745
	Singapore[1] (S)	225	1,687
AFRICA	Basutoland[3] (C)	11,716	685
	Bechuanaland[3] (P)	225,000	237
	Gambia (C and P)	4,003	284
	Ghana, Republic of (M)	92,100	6,691
	Kenya[4] (S)	224,960	7,287
	Mauritius** (C)	809	640
	Nigeria, Federation of (M)	339,170	35,297
	Rhodesia and Nyasaland, Federation of		
	Nyasaland (P)	49,177	2,890
	Northern Rhodesia (P)	288,130	2,480
	Southern Rhodesia (S)	150,333	3,140
	St. Helena** (C)	119	5
	Seychelles** (C)	156	41
	Sierra Leone (M)	27,925	2,500
	Swaziland[3] (P)	6,704	259
	Tanganyika[4] (M)	361,800	9,399
	Uganda[4] (M)	93,981	6,845
	Zanzibar and Pemba (PS)	1,020	307
AMERICA	Bahamas (C)	4,404	102
	Barbados (C)	166	232
	Bermuda (C)	21	44
	British Guiana (C)	83,000	559
	British Honduras (C)	8,866	90
	Canada (M)	3,851,809	18,238
	Falkland Islands** (C)	6,118	4
	Jamaica** (M)	4,411	1,638
	Leeward Islands (C)	422½	131
	Trinidad and Tobago (M)	1,980	828
	Windward Islands (C)	826	315
AUSTRALASIA	Australia** (M)	3,061,621	10,996
	British Solomon Islands[5] (P)	11,500	124
	Fiji (C)	7,055	394
	Gilbert & Ellice Islands[5] (C)	369	46
	Nauru (TT-A)	8¼	4
	New Guinea (TT-A)	93,000	1,376
	New Hebrides Condominium[5]	5,700	60
	New Zealand** (M)	103,736	2,439
	Tonga Islands (PS)	269	61
	Western Samoa (M)	1,130	114

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* Latest available figures. ** And dependencies.

(C) Colony; (P) Protectorate; (M) Self-governing member of Commonwealth; (PS) Protected State; (S) Internally self-governing colony; (TT-A) Trust Territory under Australia.

[1] Expected to become one of the members of the Federation of Malaysia in August 1963; [2] Excluding Jammu and Kashmir; [3] High Commission Territory; [4] Member, East Africa Common Services Organization; [5] Western Pacific High Commission Territory.

size, its capacity to defend itself, and the cultural level and political experience of its population. All these communities were formerly described as "The British Empire," but some 20 years ago Gen. Jan Christiaan Smuts (*q.v.*) pointed out that it was misleading to describe the self-governing dominions as an empire and that they really formed a "Commonwealth of Nations." This phrase has been accepted, and as now used it often includes those territories which have not yet reached dominion status but which are regarded as "junior partners" rather than possessions. See the table for the various components of the Commonwealth.

British East Africa, a geographical term formerly used to describe a large area within the British sphere of influence, extending from the Indian Ocean to the Congo, especially Kenya, Uganda, Nyasaland, Tanganyika, the Rhodesias, and Zanzibar. Later it referred specifically to Kenya, Tanganyika, and Uganda, which, on Jan. 1, 1948, established the East Africa High Commission (three territorial governors) and a central legislative assembly (speaker and 33 members). The commission was responsible for such common services as communications, income tax, and research. After Uganda and Tanganyika achieved independence, the commission was reorganized (Dec. 9, 1961) as the East African Common Services Organization, to continue these services under control of the principal political ministers of the territories. Although the term British East Africa is commonly used to include Zanzibar, neither the commission nor its successor had or has any responsibility in the protectorate.

British Guiana. See *Guiana.*

British Honduras, sometimes called BELIZE, a British colony in Central America. It is bounded on the N. by Mexico, on the E. by the Caribbean Sea, and on the W. and S. by Guatemala. The colony has an area of 8,598 sq. m. (with numerous offshore cays, 8,866). The coastal and northern sections are rather flat and swampy, while the south is rugged and mountainous, reaching 3,700 ft. Rainfall is heavy, averaging 82 in. annually, and summer temperatures sometimes exceed 100° F.

More than 90 per cent of the area is forested, and timber is the leading export; mahogany, cedar, and pine predominate. Agriculture is limited, producing chiefly grapefruit and oranges and their products. The rivers offer the chief means of transportation, but road building has recently been emphasized. Belize (pop., *ca.* 22,000) is the capital and leading port.

The lagest population group comprises Negroes and persons of mixed blood; there are smaller groups of Amerinds, Europeans, and East Indians. British Honduras was settled by the British *ca.* 1638. It became a colony under Jamaican administration in 1862 and an independent colony in 1884. Under the 1954 constitution, it is administered by a governor, who is assisted by an executive council drawn from the legislative assembly. Guatemala claims the colony as its own territory, and disputes over the matter have broken out sporadically. Population, *ca.* 77,000.

British Isles, an archipelago of Europe, located off the western coast of that continent. It is bounded on the N. and W. by the Atlantic Ocean, E. by the North Sea, and S. by the English Channel and the Strait of Dover. Great Britain and Ireland are the chief islands, besides which are included the Shetland Islands, the Hebrides, the Orkneys, and the Channel Islands. See also *Channel Islands; England; Great Britain;* etc.

British Museum, Great Britain's national museum and library, located on Great Russell St., in the Bloomsbury section of London. The institution was founded in 1753, when Sir Hans Sloane (*q.v.*) donated (under certain conditions) his collection of natural history specimens and his library of *ca.* 50,000 manuscripts to the public. Funds were raised by a public lottery, and the Sloane collection, plus the Harleian Library (collected by the 1st and 2nd earls of Oxford) were purchased. These, with the library of Sir Robert Bruce Cotton (*q.v.*), provided the basic collection of the museum. The museum was opened in 1759 in Montague House, an already existing building, and further construction on the same site was completed late in the 1850's. Among the additions was the great circular, domed reading room, made from what had been an open square (for illustration, see *Library*). The King Edward VII Galleries were added in 1914.

The museum's collection includes Greek, Assyrian, and Egyptian antiquities; many rare books, autographs, and letters; medals and coins; ethnographical material; prints and drawings; and British and medieval antiquities. The library contains *ca.* 6,000,000 volumes and many thousands of manuscripts. Specific items of note in the museum include the Rosetta Stone, which provided scholars with the first clues for deciphering Egyptian hieroglyphics, the Elgin Marbles from the Parthenon of Athens, one of the four copies of the Magna Carta, and the celebrated Greek manuscripts of the Bible, the Codex Sinaiticus of the 4th century and the Codex Alexandrinus of the 5th century. New books are acquired at the rate of 60,000 annually, owing in part to the copyright law requiring a copy of every copyrighted British publication to be deposited in the library.

In 1881-85 the natural history collections were transferred to a new natural history museum at South Kensington; in 1938 it received the Zoological Museum, at Tring, 30 m. N.W. of London.

Courtesy N. Y. Historical Society

BROADWAY AT CITY HALL, NEW YORK CITY, 1819

A major museum undertaking was the start of publication in 1958 of its General Catalogue of Printed Books, expected to total between 200 and 300 volumes of 29,000 entries each.

Briton (*brĭt′ȯn*), name for the original inhabitants of British Isles before the invasion of the Anglo-Saxons; it now signifies any native-born Englishman.

Brittany (*brĭt′ȧ-nȳ̆*), or BRETAGNE, an ancient province in western France, consisting of a large triangular peninsula that projects into the Atlantic. The region now includes the five departments of Morbihan, Finistère, Ille-et-Vilaine, Côtes-du-Nord, and Loire-Inférieure. It has an area of 13,644 sq. m. The people, called Bretons, are descendants of the Bretons who were expelled from England in the 5th century. They retained their ancient language, known as the Armorigion, which is similar to the Welsh, and is still used in the rural districts. The people engage largely in fishing and agriculture, and are noted as seamen. This region of France has not been interested extensively in manufacturing and commerce, but these industries are beginning to assume considerable importance. Many remains of the ancient Druids have been preserved in Brittany. The folklore and songs of the Bretons are among the richest, many entering as modifying factors into the writings in other languages. The district has been subject to many military contentions, but the people have shown marked loyalty to the French government, especially to the house of Bourbon. A majority of the people speak French and belong to the Roman Catholic Church. Population, *ca.* 2,500,000.

Brno (*ber′nō*). See *Brünn.*

Broadside (*brôd′sīd*), naval term meaning simultaneous discharge of all the guns on one side of a man-o'-war; or the guns themselves, whether or not in action. The term broadside is also used in advertising, in reference to a large folded sheet of paper which, when opened, makes one complete advertisement. The term also means a single large page, printed on one side only.

Broadway (*brôd′wā*), one of the most famous streets in the world, extending diagonally from the southernmost tip of New York City to the northwestern city limits. In the downtown section, an important business district, it is narrow, but the street broadens in the midtown area, where it is sometimes known as the "Great White Way," the center of the entertainment district of the city. The name Broadway is derived from the Dutch "breede weg," the old "broad way" of New Amsterdam.

Brocade (*brô-ḳād′*), a silk fabric, woven so the raised threads of the warp or woof produces figures of flowers, foliage, or other objects. The term is not applied to figures embroidered on silk textiles, but is restricted to those made in the loom. Originally the threads were made entirely of gold, or silver, or of the two mixed, and cloth of this kind was used in making the most costly dresses.

Broccoli (*brŏḳ′ō-lĭ*), a vegetable, a variety of cabbage resembling cauliflower.

Brock (*brŏḳ*), SIR ISAAC, soldier, born on the island of Guernsey, Oct. 6, 1769; died Oct. 13, 1812. He entered the British army at the age of 15. In 1799 he commanded a regiment in North Holland, where he took part in the Battle of Egmont-op-Zee, and subsequently fought with Nelson at Copenhagen. He was sent to Canada in 1802, but returned to England in 1805, and again came to America soon after on account of the threatened hostilities with the U.S. In 1810 he received command of all the troops in Upper Canada, and captured Detroit in 1812, for which he was made a Knight of the Bath. He commanded at Queenstown Heights, on the Niagara, where he fell mortally wounded on Oct. 13. A monument surmounted by a statue of Brock stands on the place where he fell.

Brocken (*brŏḳ′ẹn*), or BLOCKSBURG, a mountain of Germany, 20 m. s.w. of Halberstadt. It has an elevation of 3,745 ft. above the sea and is the highest summit of the Hartz Mts. It is famous in folklore, owing to the fact that the atmospheric conditions cause shadows of the spectators to be projected on the fog, which are best seen at sunrise. See *Walpurgis Night.*

Brockton (*brŏk′tŭn*), a city in southeastern Massachusetts, in Plymouth County, *ca.* 20 m. s. of Boston. It is served by the New York, New Haven and Hartford R.R. It is a leading shoe manufacturing and allied products center but also produces textiles, machine tools, plastics, and bakery products. The city is the center of the Brockton Standard Metropolitan Statistical Area, which includes parts of Plymouth, Norfolk, and Bristol counties (1960 pop., 149,458). The value added by manufacture for the city alone was $47,731,000 in 1958. A Veterans Admin. hospital was erected there in 1954. Brockton occupies land deeded by the Indians to Miles Standish and John Alden, and the site was settled in 1649. Population, 1960, 72,813.

Broglie (*brō′y′*), JACQUES VICTOR ALBERT, DUC DE, historian and statesman, born in Paris, France, June 13, 1821; died there Jan. 19, 1901. After a brief diplomatic career, he devoted his time to the study of history. At the age of 41, he was made a member of the French Acad. for his "Church and the Roman Empire in the 4th Century" (6 vol., 1856-66). He was elected to the national assembly (1871), served as French ambassador in London (1871-72), and was twice premier of France (1873-74, 1877). He left politics in November 1877 and continued his historical writing, chiefly on the period of Louis XV.

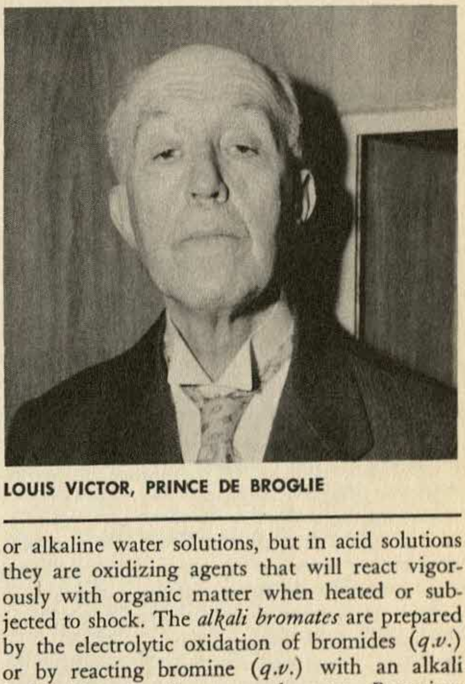
Broglie, LOUIS VICTOR, PRINCE DE, physicist, born in Dieppe, France, Aug. 15, 1892. Educated at the Sorbonne (B.A., 1909), he joined its faculty in 1928 and became professor of theoretical physics in 1933. With his doctoral thesis, *"Recherches sur la théorie des quanta,"* presented to the Sorbonne in 1924, he originated the wave theory of electrons, for which he was awarded the 1929 Nobel Prize in physics. He served as adviser to the French atomic energy commission after 1945. His books published in English include "An Introduction to Wave Mechanics" (1930), "Matter and Light" (1939), and "The Revolution in Physics: A Non-Mathematical Survey of Quanta" (1953).

Broken Wind (*brōk′ẹn wĭnd*) or HEAVES, an incurable disease in horses, due to a rupture of the air cells in the lungs. It is accompanied by an enlargement of the lungs and heart. The symptoms are most noticeable when the horse is exercised, which causes the blood to be imperfectly purified, causing the nostrils to dilate and the breathing to become labored.

Broker (*brō′kẽr*), a salaried or commissioned agent acting between owners and buyers. Brokers do not own the property they offer for sale. A *real estate broker* sells, rent, and manages property, makes appraisals of value, and arranges loans to finance purchases. An insurance broker is an independent middleman who places policies through insurance agents, for clients who depend on his judgment and knowledge of available insurance plans. A *ship broker* manages cargo, pays crews, and deals with the sale of ships. A *stockbroker* deals in shares of stock companies and certain other monetary investments.

A broker is required to apply for a license, which often depends on taking oral or written examinations. There are company- and industry-sponsored programs of study to enter these various fields.

Bromates (*brō′māts*), the salts of bromic acid, $HBrO_3$. They are stable when dry or in neutral or alkaline water solutions, but in acid solutions they are oxidizing agents that will react vigorously with organic matter when heated or subjected to shock. The *alkali bromates* are prepared by the electrolytic oxidation of bromides (*q.v.*) or by reacting bromine (*q.v.*) with an alkali hydroxide or carbonate, and water. *Potassium bromate* is used as a reagent for titrating phenol and oxalic acid. *Sodium bromate* is employed as a reagent and oxidizing agent in volumetric analysis. The uses of bromates in general are as oxidizing agents in the laboratory, but they have some commercial applications, such as to improve the baking characteristics of wheat flour and in the preparation of hair-waving lotions.



LOUIS VICTOR, PRINCE DE BROGLIE

Bromegrass (*brōm-grăs*), a genus (*Bromus*) of annual, biennial, and perennial grasses found in temperate zones. They form dense sod and often have bristle-shaped spikelets. Numerous species are native to the U.S., including *smooth brome, fescue grass,* and *mountain brome.* Some are cultivated as pasture grass, while others are troublesome weeds.

Bromfield (*brŏm′fēld*), LOUIS, novelist, born in Mansfield, Ohio, Dec. 27, 1896; died in Columbus, Ohio, March 18, 1956. He studied at Cornell and Columbia universities, leaving college in World War I to drive an ambulance for the French, who later awarded him the *Croix de Guerre*. Later, he lived for 16 years in France, before retiring to a 1,000-acre farm near Mansfield to devote himself to farming and writing. His novels skirt the realism characteristic of the 1930's; popularly written, they won many readers. His books include "The Green Bay Tree" (1924); "Early Autumn" (1926; Pulitzer Prize winner, 1927); "The Strange Case of Miss Annie Spragg" (1928); "The Rains Came" (1937); "Mrs. Parkington" (1943), "Mr. Smith" (1951); "A New Pattern for a Tired World" (1954); and "From My Experience: The Pleasures and Miseries of Life on a Farm" (1955).

Bromides (*brō′mīdz*), the salts of hydrobromic acid, HBr. Hydrobromic acid is a solution of the corrosive gas, hydrogen bromide, in water, and it is the basic material with which other chemicals are reacted to form inorganic and organic bromides. Among the inorganic bromides, the *sodium* and *potassium bromides* are used in the making of emulsions for photographic papers and plates, in process engraving and lithography, and in medicine as mild sedatives. *Calcium bromide* is also used in photography and medicine, and in the preparation of mineral waters. Calcium bromide and *lithium bromide* are both water absorptive, a quality which is useful in air-drying and refrigeration processes. *Anhydrous aluminum* and *iron bromides* are important as catalysts. *Silver bromide* is important in making light-sensitive emulsions for photographic papers and plates. All of the metallic bromides are water soluble except those of silver, lead, monovalent mercury, thallium, and gold.

The organic bromides include the bromide to which most of the bromine (*q.v.*) production in the U.S. is converted—*ethylene dibromide* (dibromoethane or EDB). It is used to make tetraethyl lead additive for antiknock motor fuels; as a solvent for fats, oils, waxes, gums, and resins; and as a grain and fruit fumigant, a wood insecticide, and an ingredient in waterproofing compounds. Ethylene dibromide and *methyl bromide* are good soil sterilization agents and food fumigants. *Methylene chlorobromide* is an excellent fire extinguisher. The *brominated phenolic compounds* are strong antiseptics and fungicides. Most of the organic bromides are highly toxic materials and must be handled carefully.

Bromine (*brō′mēn*), one of the nonmetallic chemical elements (atomic number, 35; symbol, Br; atomic weight, 79.909). It was discovered by the French chemist Antoine Jérôme Balard (1802-76). It is not found in the isolated state but occurs in minute quantities in sea water, in the ashes of marine plants, in combination with alkalis, and in the water of some mineral springs. It has a dark reddish color when in the liquid state, freezes at —7.2°C., and boils at 58.8°C. It is poisonous, has a suffocating odor, and combines readily with metals. For its uses, see *Bromates; Bromides*.

Bronchi (*brŏn′ḳī*), the divisions of the trachea or windpipe, which conveys the air into the lungs (*q.v.*). The trachea divides in the chest, forming two bronchi, one of which enters the right and the other the left lung, where they divide and subdivide to form minute tubes called bronchioles. The walls of these tubes are composed of fibromuscular tissue strengthened by plates of cartilage, and at the ends they open into clusters of air cells with thin walls where the gaseous exchange between the air and the blood takes place.

Bronchitis (*brŏn-ḳī′tĭs*), an inflammation of the bronchial lining (mucous membrane) of the lungs, often preceded by a cold in the chest. Complications may set in, and the acute form can merge into pneumonia (*q.v.*). Early sympthoms include pain in the chest, shortness of breath, and the expectoration of mucus.

Bronco (*brŏng′ḳō*) or MUSTANG, a native horse, usually an Indian pony or one bred from Indian stock. Mustang and bronco are words derived from the Spanish, meaning wild. The names are commonly used in the western part of the U.S., where they are applied to small, active horses.

Bronsted Theory (*brûn′stĕTH thē′ō-rē*). See *Chemistry*.

Brontë (*brŏn′tē*), family name of three women novelists who were born in Thornton, England; they were daughters of Patrick Brontë (1777-1861), an Irish clergyman.

ANNE (pseudonym ACTON BELL; born Jan. 17, 1820; died in Scarborough, May 28, 1849) had almost no formal education. She worked as a governess for the family for whom her brother, Branwell Brontë (1817-48), was a tutor. Her novels, "Agnes Grey" (1847) and "The Tenant of Wildfell Hall" (1848), are not so celebrated as those of her sisters.

CHARLOTTE (pseudonym CURRER BELL; born April 21, 1816; died in Haworth, March 31, 1855) was educated at a school for the daughters of clergymen at Cowan Bridge and in Belgium (1842). At their own expense, she and her sisters published a volume of poems (1846) written by all three under their respective pseudonyms. The book failed to attract much attention, and Charlotte turned to prose. Her novels include the highly successful romance "Jane Eyre" (1847), "Shirley" (1849), and "The Professor" (1857). Her novels were highly realistic, powerful and moving in description, and probably founded on experience. The Brontë genius, apparent in all

CHARLOTTE BRONTE

three sisters, was in depicting 19th-century manners and morals. In 1854 Charlotte married her father's curate, Arthur Bell Nichols (1817-1906).

EMILY (pseudonym ELLIS BELL; born July 30, 1818; died in Haworth, Dec. 19, 1848) received the same education as her sister Charlotte; she led a secluded life, of which few details are known. Her only novel, "Wuthering Heights" (1847), reveals keen understanding of human emotions. She died three months after the death of her brother Branwell, who had claimed that he was coauthor of her novel.

Brontosaurus (*brŏn-tō-sạ′rŭs*), a herbivorous dinosaur, attaining a length of 60 ft. Fossil remains are found in Wyoming, and reconstruction of the animal shows that the gigantic reptile walked on all four feet (each footprint covers a square yard), had a short trunk, long neck, strong tail, and small head.

Bronx (*brŏngks*), THE, "the borough of universities," one of the five boroughs of New York City (*q.v.*), co-extensive with Bronx County. Totaling 41 sq. m. in area, the Bronx is primarily a residential sector, with fairly large apartment houses. It is the site of Fordham Univ. and the "uptown" branch of Hunter Coll.; at New York Univ., on University Heights, is the Hall of Fame of Great Americans (*q.v.*). Within the Bronx are Bronx Park, housing the Bronx Zoo and the Bronx Botanical Gardens, and the Yankee Stadium, the largest athletic stadium in New York. Population, 1950, 1,451,277; in 1960, 1,424,815.

Courtesy Brown Bros., N. Y.

EMILY BRONTË
From a drawing by her sister Charlotte

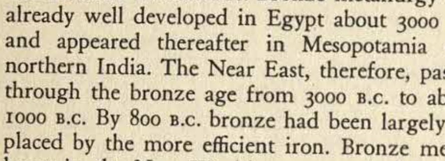
Bronxville (*brŏngks′vĭl*), a town in Westchester County, New York. See *Eastchester*, N.Y.

Bronze (*brŏnz*), a fine-grained alloy of copper and tin, in variable proportions. It is harder and more fusible than copper and is used chiefly in making church bells, cannon, statues, utensils, and various useful appliances. The ancients used it largely for weapons and utensils, and it has been found among the antiquities of China, Egypt, Assyria, Europe, and Mexico. In making common bronze the proportions are about nine parts copper to one of tin; in instruments, 12 to one; in machinery, eight to one; in musical bells, six to one, and in large bells, three to one. The metals are melted separately, and they are afterward united in a molten state and cast in molds. In some kinds of bronze, zinc, silver, and lead are added, while aluminum and copper also make a bronze alloy. The bronze formed of aluminum and copper is strong, ductile, and malleable. The proportion is one of the former to nine of the latter.

Courtesy New York Dept. of Parks

POE COTTAGE IN THE BRONX
Located in Poe Park, Grand Concourse and Kingsbridge Rd., the wooden structure was the home of Edgar Allen Poe from 1846-49

Bronze Age, a term used to denote the stage of culture of a people at the time of using bronze for implements and weapons. It followed the stone age and was superseded by the iron age (*qq.v.*) in time. The classification does not apply equally to all nations, nor to different nations in the same period. The stone age existed in some countries while others were passing through the bronze and iron ages. In the stone age, tools consisted of stone and bone, metal being yet unknown. In the bronze age, the method of alloying copper with tin had been discovered, but iron was yet undiscovered. Some geologists and archaeologists believe a copper age intervened between that of stone and bronze. Bronze metallurgy was already well developed in Egypt about 3000 B.C. and appeared thereafter in Mesopotamia and northern India. The Near East, therefore, passed through the bronze age from 3000 B.C. to about 1000 B.C. By 800 B.C. bronze had been largely replaced by the more efficient iron. Bronze metallurgy in the New World never reached a high degree of workmanship. Among the tools of the bronze age which have been found are saws, hammers, awls, sickles, knives, daggers, swords, axes, spears, arrows, anvils, gouges, and shields. The composition of bronze consisted most of 10 parts of tin to 90 of copper. In some cases, other metals were added.


BRONZE AGE PAIL

Bronzino (*brôn-dzē'nō*), IL, originally AGNIOLO DI COSIMO DI MARIANO, painter, born in Montecelli, Italy, Nov. 17, 1503; died in Florence, Nov. 23, 1572. He was a pupil of Jacopo da Pontormo (1494-1557) and court painter to Cosimo de' Medici, and his works were of the mannerist school—noble and elegant and formal in mood. His reputation is based on his portraits of members of the Medici family, but he also painted Biblical and mythological scenes, such as "Descent of Christ into Limbo," "*Pietà*," and "Venus, Cupid, Folly, and Time."

Brooch (*bro͞och*), an ornamental clasp or pin for fastening and ornamenting clothing. Brooches unearthed in ancient graves prove that these pins were known in antiquity. Probably a development of the bronze age (*q.v.*), the original brooch was little more than a simple fastener rather like a safety-pin. The medallion type of brooch, often inscribed, was a later development. Until the Middle Ages, brooches were worn by men as well as women. See also *Fibula*.

Brook (*bro͝ok*), ALEXANDER, painter, born in Brooklyn, N.Y., July 14, 1898. He received his initial art training at the Art Students League of New York (1915-19) and was given a Guggenheim Foundation fellowship in painting in 1931. His works include portrait, still life, and landscape paintings in a realistic style but with a subtle economy of detail, as in his "Katharine Hepburn" (1938) and "Georgia Jungle" (1939). He received the gold medal for design (1950) from the National Inst. of Arts and Letters, and he is represented in the collections of the Metropolitan Museum of Art and the Museum of Modern Art, both in New York City, as well as in other museums throughout the U.S.

Brooke (*bro͝ok*), SIR ALAN (FRANCIS), British field marshal. See *Alanbrooke, Alan Francis Brooke, 1st Viscount.*

Brooke, SIR JAMES, first rajah of Sarawak, born in Secrore, India, April 29, 1803; died in Burrator, England, June 11, 1868. In the service of the East India Co., he was severely wounded in Burma (1826) and sent to England. Returning to the orient on a voyage to China (1830), he made plans for the expulsion of piracy from the islands surrounding the South China Sea. He bought a schooner and sailed for Borneo (1838), where he assisted the rajah, Muda Hassim, against Dyak insurgents; he was made rajah of Sarawak (1841) for his services. He continued his efforts against piracy and was governor of Labuan (1847-57). The second rajah of Sarawak was his nephew, Sir Charles Johnson Brooke (1829-1917), who was succeeded by his son, Sir Charles Vyner Brooke (1874-). See also *Borneo*.

Brooke, RUPERT, poet, born in Rugby, England, Aug. 3, 1887; died in Scyros, Greece, April 23, 1915. Educated at his father's school in Rugby, and at Cambridge (1906-09), he began a career in poetry while doing research in English drama. He traveled in Germany and Italy (1911-12) and in America and the South Seas (1913). He received a commission in the Royal Navy in World War I. His works are "Poems" (1911), "1914 and Other Poems" (1915), and "Collected Poems" (1915).

Brooke-Popham (*bro͝ok-pŏp'ạm*), SIR HENRY ROBERT MOORE, air officer, born in Suffolk, England, Sept. 18, 1878; died in Halton, Oct. 20, 1953. Educated at Sandhurst, he joined the army in 1898, transferring to the air corps in 1912. Following service in World War I, he was commandant of the R.A.F. Staff College (1921-26) and inspector general of the R.A.F. (1935). Retiring from active duty, he was governor of Kenya (1937-39). Returned to active duty (1940), he commanded the R.A.F. in the Far East, but in 1942 reverted again to the retired list.

Brook Farm (*bro͝ok*), a community established at West Roxbury, Mass., by George Ripley (*q.v.*) in 1841. The organizer associated with himself a number of men and women prominent in American history and announced that the object was to substitute a system of brotherly cooperation for one of selfish competition. Among the members of this socialistic venture were Charles A. Dana, George W. Curtis, William H. Channing, Nathaniel Hawthorne, Bronson Alcott, Margaret Fuller, and Theodore Parker. Hawthorne made use of some of his experiences at Brook Farm in his novel "The Blithedale Romance." See also *Communism; Fourier, François; Transcendentalism.*

Brookfield (*bro͝ok'fēld*), a city in north central Missouri, in Linn County, *ca.* 120 m. N.E. of Kansas City. Served by the Chicago, Burlington & Quincy R.R., Brookfield is a business and commercial center in a farming region. Local industries include shoe manufacturing. The childhood home of Gen. John J. Pershing is located nearby. Founded in 1859, the city was incorporated in 1865. Population, 1960, 5,694.

Brookhart (*bro͝ok'härt*), SMITH WILDMAN, U.S. Senator, born near Arbela, Mo., Feb. 2, 1869; died in Whipple, Ariz., Nov. 15, 1944. He completed his normal-school training in 1889 and taught school for five years. Having also studied law, he was admitted to the bar in 1892 and practiced in Washington, Iowa. He was a county attorney in 1895-1901. He served in the Spanish-American War, on the Mexican border, and in World War I. A Progressive Republican, he represented Iowa in the U.S. Senate in 1922-25 and 1927-33. Brookhart was a foreign-trade adviser in the Agricultural Adjustment Admin. in 1933-35.

Brookhaven (*bro͝ok-hā'vęn*), a city in southwestern Mississippi, seat of Lincoln County, 55 m. s.w. of Jackson. Served by the Illinois Central and Mississippi Central R.R.'s, Brookhaven is the commercial center of a farming and lumbering region. It was founded in 1851. Population, 1950, 7,801; in 1960, 9,885.

Brookhaven, an unincorporated village in Suffolk County, on the south shore of Long Island, N.Y., 60 m. from New York City. Known as Fire Place before 1872, it dates from the late 17th century. Since 1947 it has been the location of the Brookhaven National Laboratory for atomic research, situated on the former site of Camp Upton (an army post in World Wars I and II).

Brookings Institution (*bro͝ok'ingz ĭn-stĭ-tū'-shǫn*), an organization devoted to public service, founded in Washington, D.C., in 1916. The purposes are research and publications in those areas of the social sciences which have a direct bearing on the national interest of the U.S. and in the execution of its foreign affairs. The institution is supported by its own endowment, grants from foundations, and the sale of publications.

Brookline (*bro͝ok'lĭn*), a town in eastern Massachusetts, in Norfolk County, 4 m. w. of Boston, part of the metropolitan Boston area. It is largely a residential community; the poet Amy Lowell (*q.v.*) had her home here. Cardinal Cushing Coll. and Hebrew Teachers Coll. are in Brookline, and the Longwood Cricket Club, a nationally known tennis club, is located nearby. Settled about 1630, Brookline was known as Muddy River Hamlet until it was incorporated in 1705. Population, 1940, 49,786; in 1950, 57,589; in 1960, 54,044.

Courtesy Ewing Galloway

GRAND ARMY PLAZA, BROOKLYN

Soldiers and Sailors Arch, with statuary by Frederick MacMonnies, and Bailey Fountain, by Eugene Savage

Brooklyn (*bro͝ok'lĭn*), the "City of Churches," formerly one of the largest and most important cities in the United States, but united with the City of Greater New York in 1898 by a legislative bill passed May 11, 1896. A borough of New York City (*q.v.*) and coextensive with Kings County, it is located on the west end of Long Island. It has several notable parks and many historic buildings. It is the headquarters of the Third U.S. Naval District and has a U.S. navy yard. The first settlement on its site was made by the Dutch in 1636, and it was incorporated as a city in 1834. Williamsburg and Bushwick were joined to Brooklyn in 1855. A new charter was granted in 1873 and amended in 1880 and 1881. At the time of its union with New York, Brooklyn had a population of 995,276. Population, 1905, 1,358,891; in 1950, 2,738,175; in 1960, 2,627,319.

Brooklyn College. See *New York, City University of.*

Brooks (*bro͝oks*), GWENDOLYN, poet, born in Topeka, Kans., June 7, 1917. Educated in Chicago, Ill., to which her family moved soon after her birth, she was graduated from junior college in 1936. Her early poems, published in magazines, brought her a number of awards from writers' conferences. "A Street in Bronzeville" (1945), her first volume of verse, won her two Guggenheim Fellowships (1946, 1947) for creative writing. She also received a grant from the American Acad. of Arts and Letters (1946). "Annie Allen" (1949), her second book of poetry, was awarded the Pulitzer Prize for poetry in 1950. She later wrote a novel, "Maud Martha" (1953); a book for children, "Bronzeville Boys and Girls" (1956); and another book of poems, "The Bean Eaters" (1960). Her style reflects a blending of realism with lyric intensity, presented with a highly personal staccato delivery.

Brooks, PHILLIPS, clergyman, born in Boston, Mass., Dec. 13, 1835; died there, Jan. 23, 1893. He was graduated from Harvard Coll. (1855) and received training in theology at the Episcopal Seminary, Alexandria, Va. He was ordained in 1859, went to Philadelphia, and became rector of the Church of the Advent (1859), later of the Church of the Holy Trinity (1861). In 1869 he was made rector of the Trinity Church in Boston. He often preached at Harvard, where he had wide influence, although he declined an invitation to become professor of Christian ethics and sole preacher there. In 1891 he was made bishop of Massachusetts. His fame as a great pulpit orator spread throughout the U.S., as well as to England where he preached several times. He published his sermons and a course of lectures on preaching. His other works include "The Influence of Jesus" (1879), "The Light of the World" (1890), "The Law of Growth" (1902), and the hymn "O Little Town of Bethlehem."

Brooks, VAN WYCK, critic and essayist; born in Plainfield, N.J., Feb. 16, 1886. He was graduated from Harvard (A.B., 1907), traveled abroad and lived in England, taught English at Stanford Univ. (1911-13), and was associate editor of *The Freeman* (1920-24). He worked in publishing houses, wrote essays and critical sketches, and translated many French books. His long-continued work as a critic and literary historian, however, is most important. From 1909, when his first book, "The Wine of the Puritans," was published, he reflected a personal, frequently influential, preoccupation with American literature and civilization. Besides several biographies, among them "The Ordeal of Mark Twain" (1920), "The Pilgrimage of Henry James" (1925), and "Howells: His Life and World" (1959), Brooks wrote a five-volume summation of American literary work which he called "Makers and Finders: The History of the Writer in America, 1800-1915." For the first of its volumes to be published, "The Flowering of New England" (1936), he won the 1937 Pulitzer Prize for history; he discussed the whole work in "The Writer in America" (1953). Brooks also wrote two volumes of autobiography, "Scenes and Portraits" (1954) and "Days of the Phoenix" (1957), supplemented by "From a Writer's Notebook" (1958). Some of his views on American literature were criticized with vehemence by Bernard De Voto (*q.v.*) in "The Literary Fallacy" (1944).

Broom (*bro͞om*), a plant of the bean family, native to many parts of Europe. It has yellow flowers and grows in heaths and sandy soil. Several species have been described, some of which are shrubs. The common broom is planted for its fiber, and a yellow dye is obtained from its flower. The *white broom,* cultivated in England as an ornamental shrub, bears white flowers and attains a height of 12 to 15 ft.

Broom Corn, a name applied to two plants belonging to the order of grasses, both characterized by jointed stems. The panicles of a species belonging to the *Sorghum vulgare* are made into brooms for sweeping and clothes brushes. The seeds are valuable as food for cattle and poultry. It grows to a height of 12 to 15 ft., and is cultivated very much like corn. See also *Sorghum.*

Brougham (*bro͞om*), HENRY PETER, BARON BROUGHAM AND VAUX, jurist and politician, born in Edinburgh, Scotland, Sept. 19, 1778; died in Cannes, France, May 9, 1868. He studied law at the Univ. of Edinburgh and was one of the founders of the *Edinburgh Review* in 1802. He was admitted to the bar in 1808 and entered Parliament two years later. He became a fearless and successful defender of Queen Caroline, in 1820, in the contest with George IV, and a powerful advocate of educational and legal reforms. He was raised to the peerage and accepted the position of lord chancellor in the ministry of Earl Grey, with the title of Lord Brougham and Vaux (1830). He was an able and eloquent opponent of slavery, and his advocacy of fairer representation in the House of Commons aided in the passage of the Reform Bill in 1832. With the dismissal of the Whig ministry in 1834, his official life ended; he lost his cabinet position, but continued an active member of the House of Lords for 30 years. He was one of the founders of London Univ. (1828).

Browder (*brow′dẽr*), EARL RUSSELL, author, lecturer, and former Communist leader, born in Wichita, Kan., May 20, 1891. He became associate editor of the *Toiler,* the organ of the Syndicalist League of North America led by William Z. Foster (*q.v.*), and later was office manager of a farmers' cooperative in Kansas. For violating the draft law during World War I because of his opposition to U.S. entry in the war, he served a term (1919-20) in the Federal prison at Leavenworth. He was elected general secretary of the Communist party in the U.S. in 1930, and was nominated for the Presidency on the Communist ticket in 1936 and 1940. Charged with passport fraud, he was sentenced (1940) to a four-year term in a Federal penitentiary, but after serving 14 months, was released (May 1942) by order of President F. D. Roosevelt. Accused of factional activity, Browder was removed from Communist leadership in 1945 and was expelled from the party in February 1946. He was acquitted in 1951 of a contempt of Congress charge based on his refusal to answer certain questions put to him by a Congressional investigating committee. Among his numerous publications are "Communism in the United States" (1935), "What Is Communism?" (1936), "The People's Front" (1938), "The Second Imperialist War" (1940), and "World Communism and U.S. Foreign Policy" (1948).

Brown (*brown*), in painting, a dark color formed by a mixture of red and black, and then modified by a small addition of yellow. It belongs to the colors known as russets and olives, in which a black or a dark pigment modifies the hue. Umber, bister, and brown madder are among the brown pigments.

Brown, BENJAMIN GRATZ, publisher and politician, born in Lexington, Ky., May 28, 1826; died at St. Louis, Mo., Dec. 13, 1885. He studied at Yale, and in 1850 began the practice of law in St. Louis. He soon became active in the Missouri free-soil movement. In 1852 he was elected to the Missouri legislature, serving until 1858, and during that time published a Republican newspaper, the *Missouri Democrat.* He raised a regiment for service in the Union army during the Civil War, and afterward commanded a brigade of volunteers. He was U.S. Senator (1863-67), and in 1871 became governor of Missouri. In 1872 he was candidate for Vice-President on the ticket led by Horace Greeley.

Brown, CECIL, radio news correspondent, born in New Brighton, Pa., Sept. 14, 1907. He began his writing career on an Ohio newspaper, where he worked only a short time before traveling to South America and to the Mediterranean. When he returned to the U.S., Brown became an itinerant reporter, working on newspapers all over the country. In 1937, he went to Europe as a free-lance writer. While in Rome (1940), he began news broadcasts for the Columbia Broadcasting System. Until late in 1941, Brown covered the Balkans, broadcasting about the inroads the Germans were making in that area. His greatest scoop was his report of the sinking by the Japanese on Dec. 8, 1941, of the British battleship *H.M.S. Repulse* on which he was himself a passenger. Rescued from the sea by a British destroyer, Brown went to Singapore, where he continued his broadcasting until British authorities barred him from the air when they felt he was being too pessimistic. He moved on to Australia, and finally returned to the U.S. in 1942. That same year, he published his much-disputed book "From Suez to Singapore." He left C.B.S. in January 1944, was on the news staff of the Mutual Broadcasting System until 1957, and joined the National Broadcasting Co. in 1958.

Brown, CHARLES BROCKDEN, earliest American novelist to gain international note, born at Philadelphia, Pa., Jan. 17, 1771; died Feb. 22, 1810. Of Quaker parentage, he was much influenced by the theories of William Godwin (*q.v.*), and this influence is apparent in his earlier works. His later books show a preoccupation with themes verging on the supernatural. His books include "Wieland," "Ormond," "Arthur Mervyn," "Edgar Huntley," "Clara Howard," and "Jane Talbot."

Brown, ELMER ELLSWORTH, educator, born in Kiantone, N.Y., Aug. 28, 1861; died in New York City, Nov. 3, 1934. He studied at the Illinois State Normal Univ., the Univ. of Michigan, and subsequently in Germany. He taught in the Belvidere, Ill., public schools and at the Univ. of California. In 1906 he succeeded William T. Harris (*q.v.*) as U.S. Commissioner of Education. He was appointed chancellor of New York Univ. in 1911, retiring from this position in 1933. His contributions to pedagogic literature include "The Making of Our Middle Schools" and "Origin of American State Universities."

Brown, FORD MADOX, painter, born in Calais, France, April 16, 1821; died at London, Oct. 6, 1893. His chief distinction as an artist lies in the vigor and individuality of his historical and dramatic scenes, such as "The Last of England" and "Christ Washing Peter's Feet." He was associated with the movement in art known as Pre-Raphaelitism (*q.v.*) and in 1848 was the teacher of Dante Gabriel Rossetti (*q.v.*) for a short time. From 1878 to 1893 he worked on 12 frescoes in the Manchester town hall depicting the history of the town. His biography has been written by his grandson Ford Madox Ford.

Brown, GEORGE, journalist and statesman, born in Edinburgh, Scotland, Nov. 29, 1818; died at Toronto, Canada, May 9, 1880. He went to Canada at an early age and worked as a printer in his father's establishment at Toronto. In 1844 he established the Toronto *Globe* which came to have great influence on political opinion in Ontario. In the Canadian Parliament, to which he was elected as a member of the House of Commons in 1851, he advocated such reforms as federation of the British colonies in North America and the purchase of the Northwest Territories. These measures were carried through largely because of his efforts. He died of a gunshot wound inflicted by a discharged employee.

Brown, HENRY BILLINGS, jurist, born at South Lee, Mass., March 2, 1836; died Sept. 4, 1913. He studied at Yale and was admitted to the Michigan bar in 1860. President Lincoln appointed him

Assistant U.S. Attorney in 1863, and President Grant made him district judge in Michigan in 1875. He lectured upon admiralty law at leading institutions of learning, including Yale and the Univ. of Michigan. In 1890 he became Associate Justice of the Supreme Court of the U.S.

Brown, HENRY KIRKE, sculptor, born in Leyden, Mass., Feb. 24, 1814; died in Newburgh, N.Y., July 10, 1886. He studied with Chester Harding in Boston and began to paint at an early age. In 1842 he went to Italy, where he traveled and studied for four years, then returning to New York to devote himself to bronze casting, being one of the first in the U.S. to cast his own bronzes. Among his principal productions are statues of Abraham Lincoln and Gen. Nathanael Greene; the latter is in the Capitol at Washington. He is noted for his equestrian statues of such public figures as Gen. Winfield Scott, Gen. George Clinton, Gen. Philip Kearny, and Richard Stockton. "The Seasons," "Ruth," and "The Pleiades" are well-known works in marble.

Brown, JACOB JENNINGS, soldier, born in Bucks County, Pa., May 9, 1775; died in Washington, D.C., Feb. 24, 1828. He started his career as a surveyor and school teacher, studied law in New York City, and served as military secretary to Alexander Hamilton. He entered the state militia of New York, became brigadier general in 1810, and in the War of 1812 fought against the British at Ogdensburg, Sacketts Harbor, Chippewa, Lundy's Lane, and Fort Erie, and for bravery received from Congress its thanks and a gold medal. He was in supreme command of the U.S. Army from 1821 until his death.

Brown, JOHN, physician and author, born at Biggar, Scotland, Sept. 22, 1810; died in Edinburgh, May 11, 1882. He received his medical degree from the Univ. of Edinburgh in 1833 and practiced medicine thereafter. However, his reputation is based on his literary work. His gracefully humorous essays include "John Leech and Other Papers," "Majorie Fleming: a Sketch," "Rab and His Friends." His collected essays were published as *"Horae Subsecivae."*

Brown, JOHN, abolitionist, born at Torrington, Conn., May 9, 1800; hanged at Charles Town, Va. (now in West Virginia), Dec. 2, 1859. His paternal ancestry is said to be of *Mayflower* stock. He grew up in Ohio and intended to enter the ministry but soon changed his mind. After engaging successively in land surveying, tanning, sheep raising, and the wool trade, he became bankrupt in 1842. Seven years later he took up farming at North Elba, N.Y., on a tract of land being given by Gerrit Smith (*q.v.*) to Negro settlers. Brown, who had long been a strong opponent of slavery, resolved to work actively for the destruction of the system, and in 1855 he joined five of his sons in Kansas, where the bitter controversy between "free-state" and proslavery settlers had just begun. Immediately becoming a prominent figure in the border warfare, he gained notoriety in connection with the so-called "Pottawatomie massacre" (1856). In this incident five proslavery settlers were killed in cold blood on his orders, in retaliation for the murder of five "free-state" supporters. Brown also took part in the defense of the town of Osawatomie against superior bands of proslavery Missourians, and for this reason was sometimes called "Old Brown of Osawatomie." In 1858-59 he worked out his long-dreamed-of project to establish a stronghold in the Virginia mountains as a refuge for runaway slaves. Part of his plan was to capture an immense stock of arms kept at Harper's Ferry, Va. (now in West Virginia), for which purpose he collected a small force and seized the arsenal on the night of Oct. 16, 1859.

Courtesy Metropolitan Museum of Art

THE LAST MOMENTS OF JOHN BROWN
Painting by Thomas Hovenden (1840-95)

On the morning of the next day he took the principal men of the town prisoners and awaited the uprising of the slaves, which did not materialize. Captain Robert E. Lee, with a squad of U.S. soldiers, undertook to recover the arsenal, and succeeded in this on the morning of the 18th, after many recruits had gathered, and took Brown prisoner. He was taken to Charleston, Va., where he was convicted of treason and murder and condemned to be hanged. The sentence was carried out on Dec. 2. His daring deed was an important link in the chain of events leading to the Civil War, and he became a hero in the songs of the northern armies, of which a favorite was "John Brown's Body Lies a-Moldering in the Grave," and which is still popular. He was the hero of "John Brown's Body" a long, narrative poem by Stephen Vincent Benét (*q.v.*), which was awarded the Pulitzer Prize in 1929.

Brown, JOHN GEORGE, painter, born in Durham, England, Nov. 11, 1831; died in New York City, Feb. 8, 1913. Brown studied painting in Edinburgh, then at the National Acad. of Design upon his arrival in New York City in 1853. He worked first at portraits, then turned to genre subjects, in which he studied the picturesque aspects of life in the city streets without any suggestion of social comment. "Street Boys at Play" and "Sympathy," a boot-black with his dog, are typical examples of his combination of sentimental treatment and a highly finished surface; his paintings were very popular with his contemporaries.

Brown, JOHN MASON, dramatic critic and lecturer, born in Louisville, Ky., July 3, 1900. He studied drama at Harvard Univ. and, after his graduation in 1923, studied in Europe. Brown was drama critic for the New York *Evening Post* (1929-41) and for the New York *World Telegram* (1941-42). He is known to be frank and open about his likes and dislikes in the theater, and he has often been invited to speak on the history of the drama, from Aristotle to contemporary playwrights, from nearly every lecture platform in the country. In 1942 his activities as a critic were temporarily halted while he went into the navy as a lieutenant; after the war, he became the drama critic for the *Saturday Review of Literature* and often appeared on television and radio literary panels. The author of many volumes on the theater, Brown has written "The Modern Theater in Revolt" (1929), "Letters from Greenroom Ghosts" (1934), "The Art of Playgoing" (1936), "Two on the Aisle" (1938), "Many a Watchful Night" (1944), "Morning Faces" (1949), and "As They Appear" (1952).

Brown, JOSEPH EMERSON, politician, born in Pickens District, South Carolina, April 15, 1821; died Nov. 30, 1894. Graduating from Yale Law School in 1846, he established his law practice in Canton, Ga., where he entered local politics. Elected governor of Georgia in 1857, he was thrice re-elected, serving throughout the Civil War. Although he was an outspoken Secessionist and states-rights Democrat, Brown turned Republican after the war and advocated the policy of Reconstruction. This earned him the political rebuff of his followers, which finally forced him back into the Democratic party. He became a U.S. Senator in 1880 and held his seat until 1891, when he retired.

Brown, MOSES, manufacturer and philanthropist, born in Providence, R.I., in September 1738; died there, Sept. 7, 1836. He established (1790) the first water-powered cotton mill in the U.S., patterned after Richard Arkwright's famous invention. An affluent merchant, prominent in public life, Brown contributed generously to Rhode Island Coll. (now Brown Univ.) and was influential in moving the college from Warren to Providence. Having become a Quaker in 1774, he helped to start the Rhode Island Abolition Society and donated to the Quakers the site for the Moses Brown School in Providence, a school for boys founded in 1819.

Brown, OLYMPIA, woman suffrage leader and minister, born in Prairie Ronde, Mich., Jan. 5, 1835; died in Baltimore, Md., Oct. 23, 1926. A graduate of Antioch Coll. and the Theological School of St. Lawrence Univ., she was ordained as a Universalist minister in 1863, the first woman in the U.S. to be ordained in the ministry of any church. Long an advocate of equal rights for men and women, she became, after her introduction to Susan B. Anthony (*q.v.*) in 1866, a leader in the campaign for woman suffrage. For more than 30 years, until the passage of the 19th Amendment to the Constitution made suffrage for women a reality, she traveled from state to state, lecturing and urging the extension of the franchise.

Browne (*brown*), CHARLES FARRAR. See *Artemus Ward.*

Browne, SIR THOMAS, author and physician, born in London, England, Oct. 19, 1605; died in Norwich, Nov. 19, 1682. Educated at Oxford and abroad, he received his medical degree from the Univ. of Leiden, Holland, *ca.* 1633, and thereafter settled in Norwich, England, as a country doctor. The author of many philosophical writings, he enjoys a special place as a stylist in the history of English prose. *"Religio Medici"* (1643) and *"Hydriotaphia,* or Urn Burial" (1658) are among his works.

Brownell (*brou-nĕl'*), HERBERT, JR., lawyer, politician, born in Peru, Nebr., Feb. 20, 1904. Graduated from the Yale Law School in 1927, he subsequently practiced law in New York City, where he became active in Republican party politics. He was chairman of the Republican National Committee (1944-46) and managed the 1948 Presidential campaign for the Dewey-Warren ticket. He was Attorney General under President Eisenhower from 1953 to 1957.

Browning (*broun'ĭng*), ROBERT, and ELIZABETH BARRETT, poets of the 19th century. The story of the courtship of the Brownings and of their devotion to one another after their marriage has caught the popular fancy and has provided material for biographers, novelists, playwrights, and even moving picture scenarists.

ROBERT BROWNING was born at Camberwell, a suburb of London, England, on May 7, 1812; died

Courtesy Brown Brothers, N. Y.

ELIZABETH BARRETT BROWNING

Courtesy British Information Services, N. Y.

ROBERT BROWNING

Dec. 12, 1889, in Venice. He was buried in the Poets' Corner of Westminster Abbey.

As a child, Browning made the most of his father's excellent library and of ample opportunity for the study of music and painting. He had comparatively little formal education. His gifts as a writer were soon apparent: when he was but twelve years old, his father tried unsuccessfully to find a publisher for the son's poems. Browning's first published work, "Pauline," appeared anonymously in 1833, when he was 21. His first important poem, however, was "Paracelsus," published in 1835, when he was 23. In spite of the later fame of "Paracelsus," its initial success was limited to a few discerning reviews.

Other works completed before Browning's marriage in 1846 include "Sordello" (1840), which because of its notorious obscurity harmed rather than enhanced his reputation; "Dramatic Lyrics" (1842); and "Dramatic Romances and Lyrics" (1845). During this period he also wrote a group of eight plays, including "Strafford," produced in 1837 with the famous producer and actor, Macready (*q.v.*), playing the title role; "Pippa Passes" (1841), now one of his most popular works, in dramatic form but not written for the stage; "King Victor and King Charles" (1842); and "A Blot in the 'Scutcheon" (1843), a favorite of Charles Dickens.

ELIZABETH BARRETT BROWNING, six years older than her husband, was born near Ledbury, England, March 6, 1806, and died in Florence, Italy, June 30, 1861. She was buried in Florence.

Like Robert Browning, Elizabeth Barrett was a child prodigy. In 1819, her father arranged for the private printing of a poem she had written a year or two before, "The Battle of Marathon," an "epic." A volume entitled "Essay on Mind and Other Poems" appeared in 1826, her twentieth year, but her literary career was not well launched until 1836, when she began contributing to the magazines, or perhaps 1838, with the publication of a volume entitled "The Seraphim and Other Poems." In 1844 she published two volumes under the title "Poems, by Elizabeth Barrett Barrett." These volumes included "Lady Geraldine's Courtship," a poem in which there is a flattering allusion to the poetry of Robert Browning. The poems were highly praised by various reviewers and were publicly admired by a number of distinguished men of letters—including Browning.

Elizabeth Barrett had been an invalid from girlhood and for a number of years after 1838 was in really precarious health. She lived a secluded life, with few friends, among whom Browning rapidly became the most devoted after he was introduced to her by her cousin, John Kenyon. The story of the courtship is well known. Elizabeth Barrett's father had a fanatical, perhaps an insane, objection to marriage by any of his three daughters. When Elizabeth's health had improved in 1846 and Browning had finally persuaded her to marry him in spite of her father's prohibition, she insisted upon a clandestine marriage. Her father refused his forgiveness, and she never saw him again. For the rest of her life, the Brownings lived in Italy.

Elizabeth Barrett Browning's finest work was the direct fruit of her marriage. The "Sonnets from the Portuguese," published in 1847, are a series of love poems written in secret and for Robert Browning's eyes alone. It was his decision to publish what he called "the finest sonnets since Shakespeare." This is an extravagant judgment, of course; but certainly the "Sonnets from the Portuguese" are Mrs. Browning's best work and are among the most moving love poems in the language. They assure her a permanent place in English literature. Mrs. Browning's later work includes one other famous title: "Aurora Leigh" (1856), which was by far the most popular of her works during her lifetime, and which was certainly her most ambitious poem. Its reputation has not lasted. Interest in her political poems (*e.g.,* "Casa Guidi Windows," 1851; "Poems before Congress" (1860), has not survived their immediate occasions.

During his residence in Italy with his wife, Robert Browning wrote less than before and after it, although he produced two volumes: "Christmas Eve and Easter Day" (1850) and "Men and Women" (1855). The first years after Mrs. Browning's death produced his best work: "Dramatis Personae" (1864), and "The Ring and the Book" (1868), his most ambitious and his greatest work. He continued to write prolifically and well until he died.

If Elizabeth Barrett Browning's genius was essentially lyric, as evidenced by the "Sonnets from the Portuguese," Robert Browning's was essentially dramatic, in spite of the relative obscurity of his plays. His great gift was not in the dramatic presentation of a narrative, but rather in the dramatic presentation of character. In poems like "Fra Lippo Lippi," "Andrea Del Sarto," and "Bishop Blougram's Apology," Browning raised the poetic type called the "dramatic monologue" to a peak of excellence that has not been surpassed. That his interest was primarily in character rather than in narrative is perhaps best illustrated by "The Ring and the Book," in which he illuminates his characters by telling the story of the same murder twelve times, with a different imaginary narrator for each account.

Brown-Séquard (*-sâ-ḳär′*), CHARLES ÉDOUARD, physician, born on the island of Mauritius, Apr. 8, 1817; died near Paris, Apr. 2, 1894. He was the son of an American sea captain from Philadelphia, Pa., and his mother was a French lady. In 1840 he was graduated from the Univ. of Paris, France, and was professor in the medical department of Harvard Univ., 1864-68. Subsequently he lectured in the Virginia Medical Coll., and in 1878 became professor in the Coll. of France. He contributed to the research on spinal cord, nervous system and body heat and wrote for many scientific journals. Moreover, he is the author of a number of works on medicine, the best known of them being "Archives of Normal and Pathological Medicine," published with Dr. E.C. Seguin. He originated and was ridiculed for the "Brown-Séquard Elixir," which he recommended as an injection to prolong and invigorate human life. Practical tests have proved its ineffectiveness.

Brownson (*brown′sŏn*),.JOSEPHINE, catechist. Originally a teacher in a Detroit school, she resigned in order to devote her time to religious instruction. In 1906, she established the "Catholic Instruction League" for the benefit of Catholic public school children. By 1939, she had an enrollment of 1,000 pupils and a staff of 400 teachers. Recipient of a Papal decoration, she is renowned as the first Catholic in any country to have organized catechetical instruction on such a scale. Her cultural background dates back to her grandfather, Orestes Brownson, philosopher and sociologist, and she is the author of several books in her field.

Brownsville (*brounz′vĭl*), a port city in Texas, county seat of Cameron County, on the Rio Grande, opposite Matamoros, Mexico. It is on the Southern Pacific and Missouri Pacific R.R.'s. Principal industries include refining, chemicals, clothing, and food processing. The chief agricultural products in the vicinity of the city are citrus fruits, vegetables, and cotton. The first battle of the Mexican War and the last battle of the Civil War were fought here. It was settled in 1848 and incorporated in 1853. Population, 1900, 6,305; in 1940, 22,083; in 1950, 36,066.

Brown University (*brown ū-nĭ-vẽr′sĭ-tў*), the seventh oldest college in the U.S., chartered in 1764. Opened in Warren, R.I., the following year, it moved to Providence in 1770, and received its present name (1804) in recognition of a gift from Nicholas Brown, one of the most generous of its many benefactors. Graduate work was begun in 1887 and formally organized as the Graduate School in 1927. The Women's Coll., established as a co-ordinate college in 1891, became *Pembroḳe Coll.* in 1928. In normal years before the war the university had an enrollment of 2,230 students and a voting faculty of 185. In recent years, the endowment was over $11,500,000, the annual expenditure *ca.* $2,500,000. The library contains over 650,000 volumes, exclusive of manuscripts, broadsides, and so forth. Brown Univ. grants the degrees of bachelor of arts; bachelor of science in chemistry, engineering, and nursing; master, and doctor of philosophy.

Bruce (*brōōs*), BLANCHE KELSO, public official, born in Prince Edward County, Va., Mar. 1, 1841. He was born a slave, but received some education from the tutor of his master, and taught school after securing his freedom, at Hannibal, Mo. Afterward he attended Oberlin Coll. He held several county offices in Mississippi, where he settled after the war, and in 1875 was elected to the U.S. Senate as a Republican. He served as a delegate to most of the national Republican conventions after 1868. Garfield appointed him Register of the Treasury in 1881, to which office he was again appointed by President McKinley in 1897. He ranked as an able speaker and as one of the most prominent American citizens of Negro descent. He died in 1898.

Bruce, JAMES, celebrated traveler, born in Sterlingshire, Scotland, Dec. 14, 1730; died Apr. 27, 1794. He studied at Harrow and later at the Univ. of Edinburgh, with the intention of adopting law as his profession, but engaged in the business of a wine merchant. In 1763 he was appointed consul general at Algiers. Subsequently he studied Oriental languages and the art of medicine, and entered upon a course of travel through Tunis, Tripoli, Alexandria, and Cairo, stopping for a time at Aleppo, Syria, for study. Later he ascended the Nile. In 1770 he reached Gondar, capital of Abyssinia, and afterward the source of the Abai, then thought to be the main stream of the Nile. He remained in Abyssinia two years, when he returned to Alexandria, exploring the desert of Assuan on his way back. He published five large volumes, entitled "Travels to Discover the Source of the Nile," in 1790. This work includes many interesting accounts of the habits and customs of the Abyssinians, together with their modes of life, architecture, industry, and form of government. Many of his statements were not believed at first, but they have been fully verified by recent explorers.

Bruce, ROBERT, famous and heroic Scottish king, born Mar. 21, 1274; died June 7, 1329. He was the eldest son of the Earl of Carrick, and early favored English interests with the hope that his father would be preferred for the Scottish throne. At first he swore fealty to Edward I, but later abandoned his cause, gathered vassals, and joined the Scottish army to aid in securing the independence of the country. The Scottish army was defeated a few months afterward and he made peace with the English monarch. He continued faithful to Edward I, giving valuable aid to that sovereign at different times. Later information reached him that Edward I had decided upon his death and he became hostile, and in 1306 slew John Comyn, claiming the throne himself, upon which he was crowned king, but for many years retired to the mountains for safety, a portion of the time hiding in an island off the coast of Ireland. Later he joined his brother Edward and with him started to bring the country into subjection. He landed in Scotland, where he gained advantage because of the death of Edward and the unwarlike administration of his son, who had ascended the throne as Edward II. He won back advantage after advantage until June 24, 1314, when the Battle of Bannockburn was fought, which decided the independence of Scotland. He displayed extraordinary bravery in this decisive battle, which fired the hearts of his followers and caused the complete defeat of the English, although they outnumbered the Scotch about three to one. The war continued until 1323, when Edward was again defeated near Byland Abbey. Soon after a truce was concluded, but it was speedily broken. The independence of Scotland was not fully recognized until Mar. 4, 1328. Bruce was twice married, his first wife being Isabella, daughter of the Earl of Mar. His second wife, Elizabeth, was a daughter of the Earl of Ulster. His first wife bore a daughter, Marjory, and his second wife, a son, David. The latter succeeded him to the throne as David II.

ROBERT BRUCE

Brucellosis (*brōō-çĕl′ōsis*), a specific, generalized infection characterized by a usually subacute and intermittent course with fever, weakness, sweating, loss of appetite, loss of weight, constipation, anemia, joint pains, muscle soreness, sometimes enlargement of the spleen, irritability, restlessness, and insomnia. Brucella infection is caused by a small bacterial organism (*Brucella melitensis*), three types of which are recognized: the caprine (goat), the porcine (hog), and the bovine (cattle). Goats, hogs, and cattle harbor the infection, which is contracted by man by drinking raw milk or by handling infected material. Human carriers and infection from human patients are rare. Infected animals usually do not seem ill, but characteristically are subject to abortions and premature births (Bang's Disease in cattle). Sheep and horses and occasionally other domestic animals may be infected. The infection is transferred to man via his mouth and gastro-intestinal tract, skin, or mucous membranes. This disease occurs in a spotty distribution throughout the U.S. and other countries, not in epidemic form, throughout the year, but more frequently in summer. Children are relatively immune, and people who come in close contact with cows and pigs are most subject to direct infection. An important characteristic of this disease is daily remittant (recurring and returning to almost normal) fever for weeks or months with gradual rise and decline of the highest temperature (porcine and bovine types), or, less often, undulations of fever for days or weeks with a few days of nearly normal temperature between waves (hence the name, Undulant Fever). There are many other variable symptoms and complications which must be considered in differentiating this from other diseases, especially typhoid fever (*q.v.*). An important diagnostic procedure is the specific brucella agglutination test (coagulation of freely suspended known brucella organisms by antibodies in the serum of the infected patient's blood). The average duration of the infection is three to four months, rarely years, the worst feature being prolonged invalidism. Prophylactic measures (pasteurizing milk, care in handling and discovering the disease in animals, and isolation and proper sanitary measures in the care of the infected human) are essential in preventing the disease. Treatment is symptomatic and supportive, with sulfa drugs, antisera, and vaccines thought to have some value.

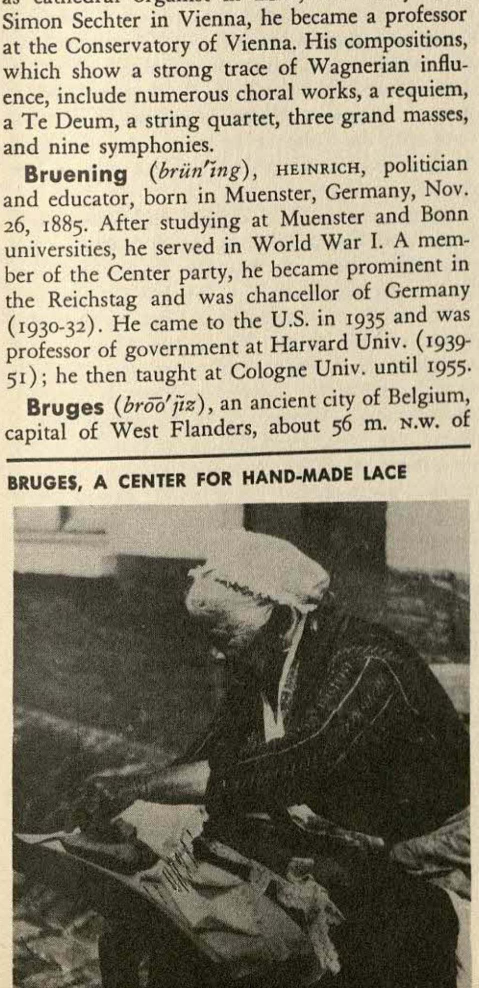
The disease is also known as Brucella Infection, Undulant Fever, Malta Fever, Mediterranean Fever, Gibraltar Fever, Goat Fever, Dust Fever, Bang's Disease, Febris Melitensis, Mittlemeer Fieber.

Bruckner (*brŏŏk'nĕr*), ANTON, Austrian composer and organist; born at Ansfelden, Sept. 4, 1824; died Oct. 11, 1896. Bruckner was largely self-trained as a musician; but in 1871, after years as cathedral organist in Linz, and study with Simon Sechter in Vienna, he became a professor at the Conservatory of Vienna. His compositions, which show a strong trace of Wagnerian influence, include numerous choral works, a requiem, a Te Deum, a string quartet, three grand masses, and nine symphonies.

Bruening (*brün'ĭng*), HEINRICH, politician and educator, born in Muenster, Germany, Nov. 26, 1885. After studying at Muenster and Bonn universities, he served in World War I. A member of the Center party, he became prominent in the Reichstag and was chancellor of Germany (1930-32). He came to the U.S. in 1935 and was professor of government at Harvard Univ. (1939-51); he then taught at Cologne Univ. until 1955.

Bruges (*brōō'jĭz*), an ancient city of Belgium, capital of West Flanders, about 56 m. N.W. of Brussels. Dating from the 3rd century, it was the center of the world's commerce in the 12th century, and is renowned as a center for hand-made lace. It is enclosed within walls, has been the seat of great military contentions, and was an important factor in the history of the Middle Ages. It is now a railroad and canal center, commerce reaching it by the largest sea vessels through three canals which connect it with the sea. Bruges belonged to The Netherlands from 1814 until 1830. In both World Wars it was captured by the Germans. Population, over 50,000.

BRUGES, A CENTER FOR HAND-MADE LACE



Bruise (*brūz*), an injury to the flesh caused by pressure or a blow, without necessarily breaking the skin. The contusion, caused by internal subcutaneous bleeding, temporarily discolors the skin.

Brumaire (*brü-mâr'*), French meaning foggy month, name for the period beginning with Oct. 23 to Nov. 21 in the calendar of the French Republic, in use from October 1793 (the year II) to December 1805. Famous is the 18th Brumaire of the year VIII (corresponding to Nov. 9, 1799) on which day Napoleon Bonaparte overthrew the Directory, the highest executive authority of the Revolution, and proclaimed himself First Consul.

Brunelleschi (*brōō-nĕl-lĕs'kē*), FILIPPO, famous architect, born at Florence, Italy, in 1377; died Apr. 16, 1446. He first studied the art of a goldsmith and afterward took up sculpture, but finally devoted himself entirely to architecture and to the revival of the ancient styles. His most remarkable product is the dome of the cathedral of Santa Maria del Fiore, Florence, the construction of which was intrusted to him after much discussion among architects. The cathedral was founded in 1296 and completed except the dome, which was proposed in 1420. He finished all but the lantern, which remained incomplete on account of his unexpected death. The dome is the largest in diameter in the world, and served as a model for Michelangelo in building the dome of St. Peter's. His other works include the churches of San Lorenzo and San Spirito, and the designs for the Pitti Palace, from which the Tuscan Palace architecture of the 15th century originated.

Brunetière (*brün-tyâr'*), FERDINAND, editor and critic, born in Toulon, France, July 19, 1849; died Dec. 9, 1906. He studied in his native city and at Marseilles and Paris, and in 1875 engaged as critical writer of the *Revue des Deux Mondes*, of which he became editor in 1895. He was chosen professor of literature in the École Normale at Paris in 1886. The following year he was made a member of the Legion of Honor, and became lecturer at the Sorbonne in 1893. As a lecturer he was well known in America, having made a tour of Canada and the U.S. in 1897. During the reli-

Courtesy Czechoslovak Information Service, N. Y.

BRÜNN. STREET VIEW

gious discussions of France in 1904, he was a zealous supporter of Roman Catholicsm. An outstanding literary critic, Brunetière is chiefly known for his method of classification of literature, which was based on the Darwinian theory.

Brunhilde (*brōōn-hĭl′dẹ*). See *Nibelungenlied.*

Brünn (*brün*), now BRNO, a city of Czechoslovakia, former capital of Moravia province, since 1949 the capital of Brno region, 70 m. N. of Vienna. It is beautifully located at the confluence of the Zvittava and Svarzava Rivers, at the foot of the Spilberk (or Spielberg), a high hill. Manufactures include textiles, hardware, chemicals, beer, and arms. Masaryk Univ. and Beneš Technical Coll. are located in Brno. Several Gothic and baroque churches and the notorious Austrian political prison on top of the Spilberk are points of interest. Founded in the 9th century, Brno became an Austrian imperial free city in 1278. Later in its history it was captured by the Swedes (1645), by the Prussians (1742 and 1866), and by the French (1865). During the 19th century, it was one of the principal manufacturing cities of the Austrian empire. After World War I, the predominant German-speaking population gradually gave way to a Czech population, until today Brno is entirely Czech in character. Population, 1947, 273,127.

Brunner (*brōō′nẽr*), EMIL, theologian, born in Winterthur, Switzerland, Dec. 23, 1889. Ordained a minister in 1912, he was professor of theology at Zurich Univ., 1924-52, later joining (1953) the faculty of the Christian Univ. in Tokyo. He also was a guest professor at Princeton Univ. (1938-39), where he received an honorary D.D. degree.

Strongly influenced by Luther, Calvin, Kierkegaard, and Karl Barth, Brunner is one of the leaders of neo-orthodox Protestantism. His "dialectical theology" is based exclusively on the Biblical Word and rejects all modifications. Man is by his nature totally separated from God, but sanctification is experienced through faith alone, in a spontaneous act of personal decision. This faith, itself a gift of the Divine Grace, gives man his responsible existence. Brunner's theology is indifferent to the question of miracles, but it affirms the goals of the ecumenical movement.

Bruno (*brōō′nô*), SAINT, known as SAINT BRUNO THE GREAT, prelate and statesman, born *ca.* 925; died in Rheims, France, Oct. 11, 965. He was appointed archbishop of Cologne and duke of Lorraine (953), and, as the brother of Emperor Otto I, he exerted both ecclesiastical and secular power. As Otto's chief administrator, he established the civil service and made his brother's court the center of a revival of learning. Bruno also instituted rigorous monastery reforms. His feast day is Oct. 11.

Bruno, SAINT, monk, founder of the Carthusian order, born in Cologne, Germany *ca.* 1030; died in Calabria, Italy, Oct. 6, 1101. He studied and later headed the episcopal school at Rheims. In 1084 he and six companions founded the first Carthusian monastery (Grande Chartreuse) in an isolated mountain spot near Grenoble, France. Pope Urban II called him to Rome as an adviser in 1090. Bruno established a second Carthusian monastery in Calabria in 1094, but it finally merged with the Cistercian order of monks. His feast day is Oct. 6.

Bruno, GIORDANO, theologian and philosopher, born near Nola, Italy, *ca.* 1548; burned as a martyr in Rome, Feb. 17, 1600. Bruno became a Dominican monk in 1563, but left the Dominicans *ca.* 1580 because he would not reconcile his opinions with theirs. He visited Geneva and several French cities, finally arriving in Paris (1581), where he lectured and wrote a satiric comedy and a number of philosophical works. The latter were partially contradictory to the doctrines of the Church and also to certain Aristotelian philosophies. After 1583, Bruno spent some time in London, Oxford, Wittenberg, Prague, Frankfort, Padua, and Venice. In Venice, in 1593, he was arrested by the Inquisition and sent to Rome. After a lengthy imprisonment and trial, he was condemned for heresy and for breaking the vows of the Dominican order. He was burned at the stake in Rome in 1600.

Bruno's philosophical works, the most important of which were *"De l'infinito, universo e mondi," "La cena della ceneri,"* and *"De la causa, principio, ed uno"* (all published in 1584), are characterized by a peculiar mixture of pantheistic (*q.v.*) philosophy of nature and certain theories of contemporary natural science, especially the new Copernican system of astronomy. In his mystical pantheism, Bruno believed that God is the universe, and that the universe is God, that creation and the created are identical. His famous terms, *"natura naturans"* and *"natura naturata,"* in their mystical vagueness are difficult to explain in modern terms. They correspond approximately to the following concepts: *"natura naturans"* means reality as a whole, continuous existence; *"natura naturata"* means the infinity of created worlds and formed objects, continuously subdividing itself, realizing all possibilities to an infinite number. The human mind represents the ultimate result of the creative power. Since it comes from the One, from the universal substance, it looks continuously for the One. Thus, for Bruno, the process of the world in time is a continuous circular current where the creating One subdivides itself into the created objects, but at the same time goes back into itself through the desire of the created mind to find the one creative principle. The One as a whole never changes, but the parts change. All the potentialities exist in time and space, and successively all of them are realized.

Brunswick (*brünz'wĭk*), county seat of Glynn County, Georgia, on St. Simon's Sound, *ca.* 72 m. s.w. of Savannah, on the Southern and other railroads. The manufactures include furniture, canned oysters and shrimp, powder, pulp, ironware, flour, cigars and cigar boxes, and machinery. Brunswick and the offshore Sea Islands are popular resorts. The first settlement on the site of the city was made by James Oglethorpe in 1735. Population, 1950, 17,954.

Brunswick, an unincorporated village in Cumberland County, Maine, on the Androscoggin River and the Maine Central R.R. Rayon textiles, paper, and lingerie are main products. It is the seat of Bowdoin Coll. The first settlement was in 1628. Harriet Beecher Stowe wrote "Uncle Tom's Cabin" in Brunswick. Population, 1950, 7,342.

Brunswick, a city in central Germany, in the *Land* of Lower Saxony and formerly the capital of Brunswick state, on the Oker River, *ca.* 125 m. w. of Berlin. A thriving industrial center, the city manufactures iron and steel, machinery, beer, fabrics, and sausages and canned meat. The old section of the city, containing medieval churches and guild houses, was severely damaged during World War II. Founded *ca.* 861, Brunswick became a city in 1031 and an important member of the Hanseatic League in the 14th century. Later it became the residence of the dukes of Brunswick (1753). After World War II Brunswick became a part of the British zone of occupation. Population, 1946, 181,375.

Brunswick, a former state in central Germany, since 1945 divided into the states (*Länder*) of Lower Saxony, in West Germany (British zone), and Saxony-Anhalt, in East Germany (Russian zone); area, 1,418 sq. m. (of the West German part, 1,182 sq. m.). The region is located on the North German plain, where grain, sugar beets, and potatoes are grown, and in the northern foothills of the Harz Mts., noted for the mining of silver, lead, copper, and iron. Brunswick was originally held by the princes of Welfen and was their most valuable state after 1180. In 1753 the capital was moved from Wolfenbüttel to the city of Brunswick (*q.v.*). From 1807 to 1813 the state was integrated with the Napoleonic kingdom of Westphalia. It became a member of the German Customs Union 1844, joined Prussia in 1866, and became a state of the German Reich in 1870. Population, 1939, 583,922 (population of the West German part, 1946, 782,950).

Brusa (*brōō'sä*). See *Bursa.*

Brush (*brŭsh*), CHARLES FRANCIS, inventor, born in Euclid, Ohio, March 17, 1849; died in Cleveland, Ohio, June 15, 1929. He was graduated from the Univ. of Michigan (1869), where he studied engineering. Brush was noted for his contributions to electricity; his most important invention was the Brush electric arc lamp, widely used for street lighting.

Brush, GEORGE DE FOREST, painter, born in Shelbyville, Tenn., Sept. 28, 1855; died in Hanover, N.H., April 24, 1941. Like many American painters of his generation, Brush studied in Paris (1874-80), with the French academician Jean Léon Gérôme, and brought back to America a solid technical background and a taste for highly finished surfaces. His first American works were romantic depictions of Indian life, like the well-known "Moose Hunt." After 1900 Brush began to paint his mother and child subjects, frankly sentimental treatments no longer in public favor, but which earned for him a great reputation and many honors within his own lifetime, including election to the National Academy in 1906.

Brush, KATHARINE, writer, born in Middletown, Conn., Aug. 15, 1902; died in New York City, June 10, 1952. Educated at Centenary Collegiate Inst. in Hackettstown, N.J., she was a motion-picture columnist for a Boston newspaper before she began writing fiction in 1923. With the appearance of "Young Man of Manhattan" (1930), a novel about a New York sports reporter, her writings won popular acclaim. Later novels included "Red-Headed Woman" (1931), "The Boy from Maine" (1942) and "This Man and This Woman" (1944). Her short-story collections include "Night Club" (1929) and "Other Women" (1932).

Brush Turkey (*brŭsh tûr'ky*), a large blackish-brown bird, *Catheturus lathami,* of eastern Australia. The resemblance to the American turkey is heightened by its reddish head and neck and the yellow wattles, but its flesh is dark and unpalatable; it is about the size of a small turkey.

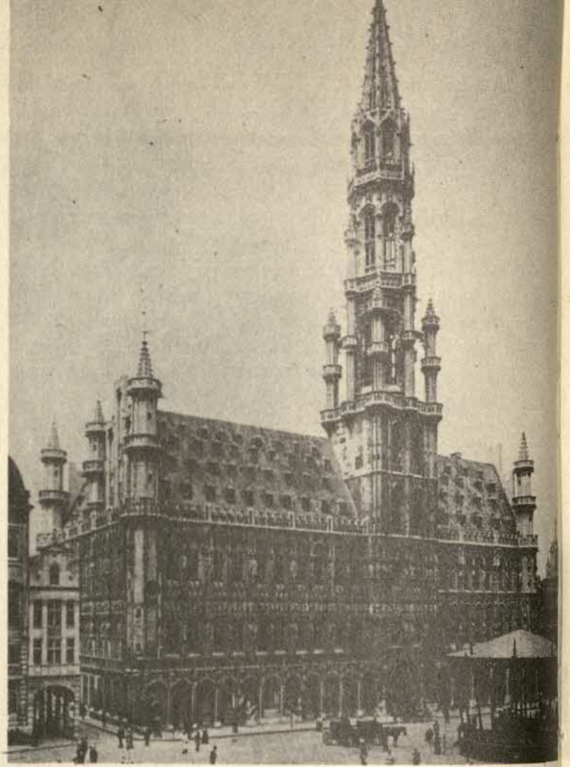
Brush turkeys are notable chiefly for building large mounds, up to 6 ft. high and 14 ft. in diameter, in which several females lay their eggs. These are incubated by the sun and the warmth of decaying vegetation. The young are able to fly almost immediately after hatching.

Brusilov (*broo-sye'lôf*), ALEKSEY ALEKSEYEVICH, soldier, born in Kutais, Caucasia, Russia, Aug. 19, 1853; died in Moscow, March 17, 1926. He began his military career at an early age, distinguishing himself in the Russo-Turkish War of 1877-78. At the outbreak of World War I, he was given command of the Russian Eighth Army which took part in the invasion of Galicia. His victories shortly won him the command of all Russian forces on the southern front. During June 1916, the so-called Great Brusilov Offensive pushed back the Austrian army, but not without heavy Russian losses; another Brusilov Offensive in 1917, meeting with eventual failure, was the last major Russian attack in World War I. Brusilov was, for a brief time, commander in chief under the Kerensky regime. In 1920 he led a Soviet invasion of Poland. He retired in 1924.

Brussels (*brŭs''lz*), the capital city of Belgium and the capital of Brabant province, in central Belgium, s. of Antwerp. It is situated on the Senne River and at the junction of the Charleroi and Willebroek canals. The former connects Brussels with the coal-mining area of southern Belgium; the latter links it with the Schelde River and provides an outlet to the sea. The center of a thriving export-import trade, the city contains diversified industries, producing lace, gloves, leather, cotton and woolen textiles, pottery, and glassware. Breweries, chemicals, furniture, and printing are also important. Here, the nucleus of Belgian finance is located—the stock exchange and the country's banking network. Brussels is, in addition, an influential cultural center. It has a university (founded 1788), academies of art and science, a music conservatory, and notable museums.

Considered one of the most beautiful cities in Europe, Brussels was built on the site of early fortifications. The older part of the city, with its winding narrow streets, provides a contrast to the wide, spacious boulevards of the modern section. On the famous public square of the Grande Place is a fabulous cluster of medieval and Renaissance buildings, including the city hall (15th century), the Maison de Roi, the Gothic-styled meeting place of the States-General, and the parliament building (18th century). The Cathedral of St. Gudule (built 1220-72), also known as St. Michael's Church, is one of the finest examples of Gothic architecture.

The origin of the city dates back to the settlements of Gauls and Romans who migrated to the Senne River district in order to escape the conquering Franks. The city was walled in the 10th century; by the 13th century it was the center of the wool industry, and in the 15th century it became the capital of Brabant. The thriving commerce of medieval Brussels was matched by the opulence and gaiety of its life. In 1530 the city fell under the rule of the Hapsburgs, who made it the capital of the Spanish Netherlands. The numerous wars fought in the Low Countries during the 16th, 17th, and 18th centuries by France, Spain, and Austria severely damaged Brussels' prosperity. In 1789 it was the center of a rebellion against Austrian rule in the Netherlands. Later, in 1819, it was made the alternate meeting place, with The Hague, of the Netherlands parliament. Since 1831 it has been the capital of an independent Belgium. It was occupied by German troops in both world wars, but suffered no serious damage. The city is bilingual, French and Flemish being the native languages. Population, 1951 est., with suburbs, 965,947.



Courtesy Canadian Pacific Railway, N. Y.

HÔTEL DE VILLE, BRUSSELS, BELGIUM

The city hall in Brussels dates back to the 15th century. Its richly decorated façade was begun in 1410. The 360-ft. tower, crowned with the figure of St. Michael, was completed in 1454. This building, with its beautiful and manifold decorations, is one of the finest examples of high Gothic architecture

Brussels Sprouts (*brŭs''lz sprouts*), a commercially grown vegetable. A variety of the cabbage species *Brassica oleracea gemmifera,* it forms many small heads along the side of a tall stem, instead of the more usual single large head.

These miniature cabbages are cut when about 1 in. in diameter. Several cuttings are made as the buds mature from the base upward. Long Island, N.Y., is a major production center.

While other varieties of the cabbage species, such as ordinary cabbage and cauliflower, have been known since classical times, Brussels sprouts have been known for only a few hundred years.

Brussels Treaty, a 50-year treaty promulgated in March 1948 by Great Britain, France, Belgium, The Netherlands, and Luxemburg, which provided for mutual defense against aggression, and military, political, and economic cooperation. The formation of the alliance was brought about by fear of Soviet imperialism. The U.S. supported the pact, and President Truman described it as "a notable step in the direction of unity in Europe for the protection and preservation of its civilization." Economic implementation of the agreement was delegated to the Organization of European Economic Cooperation, created in April 1948 by the member nations participating in the European Recovery Program (*q.v.*).

A Permanent Defense Organization for Western Europe was established by the defense ministers of the five powers in September. Field Marshall Viscount Montgomery (*q.v.*) was chosen as first chairman of the new body. An historic step occurred in 1949 when the Brussels Treaty nations joined seven other countries in the signing of the North Atlantic Treaty (*q.v.*) for the mutual defense of all signatories.

The first major step toward political implementation of the Brussels Treaty occurred in 1949 when the Council of Europe was formed along the lines of federation. Members of the council include the original Brussels Treaty signatories and ten other countries. In 1954 West Germany and Italy were brought into the Brussels Treaty under a new seven-nation defense coalition—the Western European Union. Arrangements were made to (*1*) bring West Germany into NATO and to restore its sovereignty with a voluntarily accepted limit on its arms production; (*2*) broaden the authority of the NATO commander over use and supply of army units; and (*3*) establish agencies to control armaments of all countries involved. See also *Europe, Council of; North Atlantic Treaty; World Government.*

Brut (*brōōt*) or BRUTUS, the legendary founder of Britain. According to tradition, he was the great-grandson of Aeneas (*q.v.*). After accidentally killing his father, Brut fled to Greece and then to Britain, where he settled with the few remaining Trojans. He founded Troynovant, or New Troy (later known as London), and sired a line of British kings, including Coel (Old King Cole), Cymbeline, and Arthur. The Brut legend first appears in the histories of Nennius and Geoffrey of Monmouth (*q.v.*).

Bruttium (*brŭ'tē-um*), in ancient times, the southernmost extremity of Italy, corresponding almost exactly with modern Calabria (*q.v.*). Bruttium was settled in the 8th century B.C. by Greek colonists. At the end of the Second Punic War (201 B.C.) its inhabitants, who had allied themselves with Hannibal, lost their independence and were sold as slaves by the Romans.

Brutus (*brōō'tŭs*), a traditional surname of the Junian gens, or clan, of ancient Rome. According to legend, the name, which means stupid, was first given to LUCIUS JUNIUS BRUTUS, a semihistorical figure of the 6th century B.C., who escaped death at the hands of his uncle, Tarquin the Proud (Tarquinius Superbus), by feigning idiocy. After the rape of Lucretia (*q.v.*) by one of the Tarquins, Brutus dropped his pretence and led the people in driving the kings from Rome. As one of the first consuls of the republic (*ca.* 509 B.C.), he condemned to death his two sons, Titus and Tiberius, for their part in a conspiracy to restore the monarchy. When Tarquin attempted to return to Rome, Brutus led an army against him and was killed (*ca.* 507) in single combat with Aruns, Tarquin's son.

MARCUS JUNIUS BRUTUS, politician and general, and chief assassin of Julius Caesar (*q.v.*), was born in 85 B.C., and died in 42 B.C. During the civil war between Pompey and Caesar he sympathized with Pompey, but after the battle of Pharsalia (48) he went over to Caesar, who appointed him governor of Cisalpine Gaul (46), and urban praetor (44). In 44 Brutus was persuaded by Cassius (*q.v.*) to join the conspiracy which was intended to restore republican government to Rome. After the assassination of Caesar, Brutus fled to Greece and joined Cassius and his army in Macedonia. At the battle of Philippi (42 B.C.) the young Octavianus (later Augustus) and Mark Antony defeated their forces, and Brutus committed suicide. In Shakespeare's "Julius Caesar" Brutus is characterized as "the noblest Roman of them all." A less savory side of his character is brought out in Cicero's letters, where he is described as a usurious moneylender.

Other Roman dignitaries who were surnamed Brutus were DECIMUS JUNIUS BRUTUS (executed 43 B.C.), a Roman general, and a Roman consul of the same name who lived in the 2nd century A.D.

Bryan (*brȳ'ạn*), CHARLES WAYLAND, politician, born in Salem, Ill., Feb. 10, 1867; died in Lincoln, Nebr., March 4, 1945. After studying at the Univ. of Chicago, he went to Lincoln, Nebr., where he served as business manager for his brother, William Jennings Bryan (*q.v.*), and as publisher and associate editor of the *Commoner,* a political periodical. He also was successively alderman, street commissioner, and mayor of Lincoln. In 1922 he was elected governor on a platform of public economy and was again governor of Nebraska in 1931-33 and 1933-35. He was nominated for Vice President, in 1924, on the Democratic ticket with John W. Davis (*q.v.*).

Bryan, WILLIAM JENNINGS, statesman, born in Salem, Ill., March 19, 1860; died in Dayton, Tenn., July 26, 1925. Silas L. Bryan, his father, was a lawyer and public official in Illinois, having served in the state senate for 12 years and as a circuit judge. The younger Bryan was educated at Whipple Acad., Illinois Coll., and the Union Law School of Chicago. He began the practice of law at Jacksonville, Ill.; in 1887 he moved to Lincoln, Nebr., where he entered a law firm. Here, he evidenced an interest in Democratic politics and demonstrated his remarkable ability as a speaker. In 1890 and 1892 he was elected to the House of Representatives from a predominantly Republican district of Nebraska and soon became known for his hard work and his eloquence. In 1894 he ran for Senator, basing his campaign on his stand for bimetallism, or free coinage of silver. After being defeated, he served as editor in chief of the Omaha *World Herald* from 1894 to 1896, when he became a prominent candidate for the Democratic Presidential nomination.

At the Chicago convention in July 1896, he made his "Cross of Gold" speech advocating bimetallism. This was his most famous oration and was an important factor in his winning the nomination the next day. He was later also nominated to run on the Populist ticket. In the election Bryan carried the states of the late Confederacy and most of the Far West, but he was defeated by McKinley, who received 7,035,638 popular and 271 electoral votes, while Bryan received 6,467,946 popular votes but only 176 electoral votes. After his defeat, Bryan lectured extensively, mainly on bimetallism, and published a book on the subject, entitled "The First Battle." At the Democratic national convention in 1900, he was again nominated for the Presidency but was again defeated in the election, winning 155 electoral votes to McKinley's 292. In 1901 he established the *Commoner,* a weekly publication, at Lincoln, Nebr. He made a tour of the world (1905-06), visiting leading countries in Europe and Asia.

Bryan received his third Presidential nomination in 1908 at the Democratic convention in Denver, Colo., and ran unsuccessfully against William H. Taft. Still a potent force in Democratic politics, he was instrumental in the nomination of Woodrow Wilson in 1912 and entered Wilson's cabinet in 1913 as Secretary of State. He resigned in 1915 because he favored a more conciliatory policy than the administration adopted toward Germany. Though he exerted less influence in politics during his remaining years, he continued to work for causes in which he believed. These included many principles now incorporated into U.S. law: the Federal income tax, the election of Senators by popular vote, publication of campaign contributions, and woman suffrage. He was a staunch supporter of religious fundamentalism and in 1925 assisted in the prosecution of the Scopes trial (*q.v.*), the famous evolution case in Tennessee at which Clarence Darrow (*q.v.*) served as the lawyer for the defense.

WILLIAM JENNINGS BRYAN

Bryant (*brī′ant*), WILLIAM CULLEN, poet and journalist, born in Cummington, Mass., Nov. 3, 1794; died in New York City, June 12, 1878. When only eight years old he began to write verse. He was educated at North Brookfield and Plainfield, Mass., and at Williams Coll., but he left school in 1811 to study law and was admitted to the bar in 1815. He practiced law at Plainfield and later at Great Barrington, where he was married to Frances Fairchild in 1821. After a brief legal career, he turned to journalism—becoming coeditor of a monthly magazine, the *New York Review and Athenaeum,* in 1825 and assistant to the editor of the New York *Evening Post,* a newspaper, in 1826. Bryant's life, thereafter, was closely tied to the *Post,* of which he became editor and part owner in 1829. Under his direction, the newspaper prospered and gained repute for its high standards of journalism and its free-trade, antislavery views. Bryant himself played a significant role in political events. After supporting Jackson and the Democratic party, he transferred his paper's support to the Free Soil party during the 1848 Presidential campaign; he allied himself with the new Republican organization in 1856. Throughout the Civil War, he was a strong advocate of the Union and emancipation, on occasion criticizing Lincoln for moderation.

Bryant made a number of visits to Europe for the study of language and literature. His best poem, "Thanatopsis," was written in his 18th year and was first published in September 1817, in the *North American Review*. His foreign letters, written while abroad, were perused with much interest by the American people. They were known as "Letters of a Traveler" and "Letters From Spain and Other Countries." He possessed facility of speech and delivered many impressive public addresses, including those at the banquet of Kossuth, at the Burns centennial, and at the Schiller festivities. Other great addresses include an oration on Goethe and the speeches made at the dedication of the statues of Morse, Shakespeare, Scott, and Halleck. These "Orations and Addresses," as they are known, were published in book form in 1873. He translated the "Iliad" and the "Odyssey," and published them, 1870-72. His last public address was delivered at the unveiling of the statue of Giuseppe Mazzini in Central Park, New York City, May 28, 1878, where he was overcome by the heat and greatly injured, from which he never recovered. Bryant was a poet of nature, his verse overflowing with the "religion of the woods," and his prose is touched with an exquisite grace. He ranks with Longfellow and Poe. His fault lay rather in writing too little instead of devoting his energies to large productions and bidding for an immortal fame.

Courtesy Brooklyn Museum, N. Y.

WILLIAM CULLEN BRYANT

Bryce (*brīs*), GEORGE, author, born at Brantford, Ontario, Apr. 22, 1844; died Aug. 5, 1931. He was educated at the Brantford High School and the Univ. of Toronto, and was awarded many prizes and medals for efficient work as a student. In 1870 he was made examiner in natural history at the Univ. of Toronto, and the following year was sent by the general assembly of the Presbyterian Church of Canada to organize a church and college at Winnipeg, where he established the Knox Church and Manitoba Coll. He was one of the founders of the Univ. of Manitoba, which was established in 1877, and in this institution he was examiner in science from that year until 1904, when he became chairman of the faculty of science. He was influential and successful in home missionary work, organizing 70 churches, and was moderator of the general assembly of the Presbyterian Church in Canada, 1902-03. In 1905 he was made president of the Historical and Scientific Society of Manitoba. Among his chief writings are: "The Apostle of Red River," "Manitoba: Infancy, Progress, and Present Condition," "The Makers of Canada," and "Remarkable History of the Hudson's Bay Company."

Bryce, JAMES, author and statesman, born in Belfast, Ireland, in 1838. He studied at Glasgow and Oriel Coll., Oxford, and in 1870 became regius professor of civil law at Oxford Univ., in which position he served successfully until 1893. His political life began in 1880, when he was elected a member of Parliament as a Liberal. In 1896 he was made undersecretary of state for foreign affairs, and was given a seat in Gladstone's cabinet in 1892. He was not only conspicuous as a Liberal leader and as a follower of Gladstone, but took a prominent part in the agitation for home rule in Ireland, and advocated international copyright and a complete revision of the statute law. In 1905 he became chief secretary for Ireland, in the ministry of Sir Henry Campbell-Bannerman. He was appointed ambassador to the U.S. in 1906. His best-known publication is "The American Commonwealth," for which he collected material during three visits to the U.S. Other books include: "Impressions of South Africa," "Transcaucasia and Ararat," "The Holy Roman Empire," and "The Flora of the Island of Arran." He died Jan. 22, 1922.

Bryce Canyon National Park, Utah, one of the national parks of the Federal government, created in 1928, area of 56 sq. m. Near Salt Lake City, this park contains rocks among the most colorful of any of the earth's crust, whose flaming brilliance has given rise to the appellation, "the canyon of fire." Exposed in its boxlike canyon are a thick array of strange, grotesque forms, shaped by erosion into castles, galleries, towers, buttresses, and innumerable other architectural fantasies.

Bryn Mawr College (*brĭn mär*), an educational institution at Bryn Mawr, Pa., about 5 m. w. of Philadelphia, on the Pennsylvania R.R. The college was founded for the education of women by Joseph W. Taylor, a member of the Society of Friends, in 1885. The campus is laid out on 60 acres of beautiful rolling country, with buildings of gray stone in collegiate Gothic architecture. The library contains more than 200,000 volumes. Full graduate and undergraduate instruction is offered in the liberal arts and sciences. It has an endowment aggregating over $6,000,000. The faculty consists of *ca.* 90 professors and instructors, and the students in attendance numbered 748 in the fall of 1953.

Bryophytes (*brī′ō-fīts*), one of the four divisions of the plant kingdom, including some members which do not produce flowers. It is divided into two divisions, one including the mosses and the other the liverworts. The former have a vertical axis and a leafy body, while the latter have a horizontal axis and a thalloid body. These plants do not have true roots, and propagate largely by spores and a class of cells known as *elators.* See *Liverwort; Mosses.*

Bryson (*brī′sŏn*), LYMAN (LLOYD), educator, born in Valentine, Nebr., July 12, 1888; died in New York City, Nov. 24, 1959. He received his M.A. degree in 1915 from the Univ. of Michigan, where he taught rhetoric and journalism before joining the American Red Cross during World War I. Associated with the Red Cross during the 1920's, he also served as an extension lecturer at the Univ. of California and worked in adult education. In 1934 he went to Teachers Coll., Columbia Univ., as a visiting professor, remaining there as a professor of education until 1953. He was also affiliated with the Columbia Broadcasting System, particularly in connection with adult-education programs such as "The People's Platform" and "Invitation to Learning." During World War II, he served with the Office of War Information. Bryson's published works include short stories, poetry, and such books on education as "Science and Freedom" (1947), "Communication of Ideas" (1948), and "The Drive Toward Reason" (1954).

Bryusov (*bryo͞o′sôf*), VALERY VAKOVLEVICH, writer, born in Moscow, Russia, Dec. 13, 1873; died there, Oct. 9, 1924. The founder of Russian symbolism, Bryusov was a prolific and versatile writer of novels, plays, and literary criticism. For years, he exerted a profound influence on younger writers. During World War I, he served as a war correspondent for a Moscow newspaper, and after the Bolshevik Revolution he joined the Communist party. Perhaps his best known volume of poetry is "Stephanos" (1906). An English translation of his short stories appeared as "The Republic of the Southern Cross" (1918). Translations of his poems are included in the anthology "A Treasury of Russian Verse" (1949), edited by Avrahm Yarmolinsky.

Bubastis (*bū-băs′tĭs*) or BUBASTUS, an ancient Egyptian city, situated in the delta of the Nile, near modern Zagazig, now in ruins and called Tel Basta. It was so named from the lion- or cat-headed goddess, Bast, whose festivals were among the most important celebrated by the Egyptians. The city flourished as the capital of Egypt during the 22nd and 23rd dynasties, declining after the Persian conquest of 343 B.C. Excavations were made in 1886 and 1887. Bubastis is the Biblical Pi-Beseth (Ezekiel 30:17).

Bubonic Plague (*bû-bŏn′ĭḳ*). See *Plague.*

Buccaneers (*bŭḳ-ȧ-nērz′*). See *Piracy.*

Bucephalus (*bū-sĕf′ȧ-lŭs*), the favorite horse of Alexander the Great which accompanied him in all his campaigns. It died in India from the effects of wounds received in a battle about 326 B.C., and the great commander built the city of Bucephala in its honor.

Bucer (*bo͞o′tsēr*) or BUTZER, MARTIN, Protestant reformer, born in Schlettstadt (Alsace) in 1491; died in Cambridge, England, in 1551. Originally a member of the Dominican order, he came under the influence of Martin Luther in 1518; he left his order, married a former nun, and was excommunicated in 1523. As president of the Church Council in Strasbourg he there introduced a Protestant liturgy. Holding an intermediate position between Luther and Zwingli, he tried in 1529 (at the famous disputation of Marburg) to reconcile their conflicting views on the question of the real presence of Christ in the Eucharist, but failed. In 1536, however, he signed the Wittenberg Concord, which essentially confirmed Luther's doctrine. Estranged from the Swiss Protestants by this agreement, he also came in conflict with the authorities of Strasbourg, when he refused to accept the Augsburg Interim in 1548. Bucer therefore accepted in 1549 a call to a professorship in Cambridge. Although opposed by the conservative English bishops, he participated in the revision of the Book of Common Prayer.

Buchan (*bŭḳ′ạn*), JOHN (1ST BARON TWEEDSMUIR), British author and statesman, born in Perth, Scotland, Aug. 26, 1875; died in Montreal, Canada, Feb. 11, 1940. During World War I, he served (1915) in France as a war correspondent; he then became director of information of England. He was a member of Parliament from 1927 to 1935, when he became a peer and governor general of Canada, serving until his death. His writings include many adventure novels, particularly "The Thirty-Nine Steps" (1915) and "Greenmantle" (1916); "History of the Great War" (4 vols., 1921-22); "Oliver Cromwell" (1934); and an autobiography, "Pilgrim's Way: An Essay in Recollection" (1940).

Buchanan (*bû-ḳăn′ạn*), FRANKLIN, naval officer, born in Baltimore, Md., Sept. 17, 1800; died in Talbot County, Md., May 11, 1874. The chief adviser to Secretary of the Navy George Bancroft (*q.v.*) in planning the U.S. Naval Academy at Annapolis, he was that institution's first superintendent (1845-47), a post he resigned in order to fight in the Mexican War. He next commanded the flagship of Matthew C. Perry's expedition to Japan and was the first U.S. officer ever to set foot (1853) in Japan. With the outbreak of the Civil War, he resigned his captaincy in the U.S. Navy and entered the Confederate navy with the same rank. His outstanding handling of the *Merrimac* (*q.v.*) in the battle (1862) against a Union squadron won him a promotion to admiral. As commander of the Confederate navy in the battle of Mobile Bay (1864), he was defeated by David Farragut (*q.v.*). See *Perry, Matthew C.*

Buchanan, JAMES, 15th President of the U.S., born in Mercersburg, Pa., April 23, 1791; died at Wheatland, Pa., June 1, 1868. Buchanan's parents were Scotch-Irish immigrants. He was educated at Mercersburg and at Dickinson Coll. (Carlisle, Pa.), from which he was graduated in 1809. He read law and was admitted (1812) to the bar in Lancaster, Pa. In 1814 he entered the Pennsylvania house of representatives as a Federalist. Buchanan was elected to Congress as a Federalist in 1820, but in 1824 he left the disintegrating party to join the rising forces of Andrew Jackson. During his ten years in the House perhaps his most notable achievement was his action as chairman of the House Judiciary Committee, by which the Supreme Court retained appellate jurisdiction based on writs of error. Buchanan represented (1831-33) the U.S. in Russia and was elected to the Senate on his return to America. As a Senator (1833-45), despite a dislike for the institution of slavery, he supported the states' right to prevent distribution through the mails of material on the slavery controversy. His service in Russia had awakened an interest in foreign affairs, and he advocated expansionist policies. President Polk named him Secretary of State, in which position (1845-49) he showed considerable skill. He insisted that Mexico pay the American claims she had acknowledged in 1837. He tried to buy Cuba from Spain and worked against English and French attempts to keep Texas from accepting annexation by the U.S. After a short period of retirement, he was named minister to England (1853-56), where he participated in the drawing up of the Ostend Manifesto (*q.v.*) of 1854. His part in the drafting of the document won him Southern support. This fact and his absence during the struggle over the Kansas-Nebraska Act (*q.v.*) made him a ready candidate for the Presidency in 1856.

As President (1857-61), Buchanan continued a strong foreign policy. He secured a treaty of friendship and commerce with China, received embassies from Siam and Japan, tried to buy Cuba, and aided the Juárez regime in Mexico. Domestically, however, his acceptance of the low tariff schedule in 1857 alienated Pennsylvania and the Northwest. Although he attempted to preserve a balance between slavery and antislavery forces, his support of the proslavery cause in Kansas destroyed the Democratic party as a national institution and helped win the Presidency for Lincoln. Faced with the threat of Southern secession during the period between the November election and the March inauguration of Lincoln, Buchanan proceeded on the premise that secession violated the Constitution, but that the Federal government was without constitutional authority to prevent it. Thus barred from action, he watched the nation break apart while he pleaded for compromise, constitutional revision, and the maintenance of the Union. His publication, "Mr. Buchanan's Administration on The Eve of the Rebellion," appeared in 1866.

Courtesy National Gallery of Art, Wash., D. C.

JAMES BUCHANAN

Painting by George P. A. Healy (1808-1894)

Buchanan, ROBERT WILLIAM, writer, born in Caverswall, Staffordshire, England, Aug. 18, 1841; died in London, June 10, 1901. He was educated at Glasgow Univ. and, at the age of 19, went to London where he published (1863) his first work, "Undertones." Three years later, he achieved recognition with his "London Poems." His writings give evidence of great versatility as a critic, novelist, and dramatist. In 1871 he touched off a bitter controversy with Dante Gabriel Rossetti (*q.v.*) when he attacked the Pre-Raphaelites (*q.v.*) with his satirical article, "The Fleshly School of Poetry." Buchanan later apologized to Rossetti and dedicated his novel, "God and Man" (1881), to him. Among his writings are "Ballads of Life, Love, and Humour" (1882) and "The Wandering Jew" (1893), considered one of his best works.

Bucharest (*bōō-k̨ȧ-rĕst′*), or BUCURESTI, capital and largest city of Rumania, on the Dâmboviţa River, a tributary of the Danube, *ca.* 50 m. N. of the Bulgarian border. One of the largest centers of the Balkan peninsula, it has extensive industries and railroad facilities. Varied manufactures include textiles, leather, metals, chemicals, foodstuffs, machinery and oil. As the cultural and educational center of Rumania, Bucharest has the oldest university in Rumania, the only school of technology in the country, and numerous vocational institutions. The city is also the seat of the primate of the Greek Orthodox Church.

The former capital of Wallachia, the city was the residence of the Wallachian princes from the 14th century to 1861. Bucharest was the scene of three important peace treaties: the 1812 peace treaty between Russia and Turkey, the Treaty of Bucharest which concluded the Second Balkan War in 1913, and the 1918 Treaty of Bucharest between the Central Powers and Rumania. The city was taken by the Germans during both World Wars. On Aug. 31, 1944, it was occupied by the Russians. Population, 1958 (est.), 1,279,000.

Buchenwald (*bōō′k̨ĕn-vält*), a former German concentration camp (*q.v.*) near Weimar.

Buchman (*bo͝ok̨′mąn*), FRANK NATHAN DANIEL, evangelist, born in Pennsburg, Pa., June 4, 1878; died in Freudenstadt, Germany, Aug. 7, 1961. Educated at Muhlenberg Coll., he was ordained a Lutheran minister in 1902. He went to England in 1921, where he established the Oxford Group Movement (*q.v.*), also known as Buchmanism, Moral Re-Armament, or M.R.A., with world headquarters in Caux, Switzerland. He is credited with having taken a major role in the postwar reconciliation of France and Germany. He wrote "Remaking the World" (1946).

Buchner (*bŭϵ′nēr*), EDUARD, chemist, born in Munich, Germany, May 20, 1860; died in Focşani, Rumania, Aug. 24, 1917. He began his research in organic chemistry while studying at the Munich Polytechnic Inst. In 1897, he announced his important discovery that alcoholic fermentation of sugar is produced by an enzyme, "zymase," and is not dependent on the activity of yeast cells. His experiments in the field were described in his book, *"Die Zymasegärung"* ("Zymase-fermentation," 1903). His discovery of cell-less fermentation won for him the Nobel Prize in chemistry in 1907. Buchner was killed during World War I while serving in the German army.

Büchner (*bük̨′nēr*), KARL GEORG, dramatist, born in Goddelau, Germany, Oct. 17, 1813; died in Zurich, Switzerland, Feb. 19, 1837. While still a student at Giessen Univ. (1833), he demonstrated great talent as a scientist and political thinker. His authorship of a revolutionary pamphlet, in which he condemned the economic features of German society, made him politically suspect. In his flight from the police, Büchner went to Strasbourg and then to Zurich, where he obtained a position as an anatomy instructor at the university.

His reputation as a dramatist rests on three plays: the powerful tragedy, *"Dantons Tod"* ("Danton's Death," 1835), the satirical comedy "Leonce und Lena" (1836), and the incomplete tragedy "Woczeck" (1836-37), on which Alban Berg based his opera, "Wozzeck." More recently critics have compared Büchner's work with that of Goethe.

Buck (*bŭk̨*), DUDLEY, composer and organist, born in Hartford, Conn., March 10, 1839; died in Orange, N.J., Oct. 6, 1909. He studied at Trinity Coll., Hartford, and at the Leipzig (Germany) Conservatory of Music. In 1862 he was appointed organist of the North Congregational Church in Hartford and subsequently was organist in various churches in Boston, Chicago, and New York. Well known as a concert organist, he composed works, including cantatas, hymns, and anthems, which had a signal influence on American church music. Among his cantatas are "Voyage of Columbus" (1876), "The Golden Legend" (1880) and "Light of Asia" (1885). He also wrote secular choral works, including "The Nun of Nidaros" (1879) and "King Olaf's Christmas" (1881).

Buck, PEARL SYDENSTRICKER, author and missionary, born in Hillsboro, W.Va., June 26, 1892. The daughter of an American missionary, she spent her childhood in China. Returning to the U.S. for her education, she attended Randolph-Macon Coll. for Women. After graduation, she went to China to teach English literature. There she married John Lossing Buck, a teacher and missionary. During the 1920's she taught at several universities in China, but in 1931 she retired from teaching to devote her time to writing and lecturing. After a divorce in 1935 she married Richard Walsh, her publisher. She received the Nobel Prize for literature in 1938. Her works include "East Wind, West Wind" (1930), "The Good Earth" (1931; Pulitzer Prize, 1932), "The Patriot" (1939), "Dragon Seed" (1942), "My Several Worlds" (autobiography, 1954), and "Letter from Peking" (1957). She also uses a pseudonym, John Sedges. For illustration see next page.

Buckboard (*bŭk̨′bōrd*), a light, four-wheeled,

Photograph by Karsh, Ottawa

PEARL S. BUCK

horse-drawn vehicle which was in general use about the middle of the 19th century. It was so named because of its bucking or bouncing. It consisted of a simple floor or platform of elastic boards mounted directly upon the axles and carried one or two seats. It was particularly adapted to crossing rough country.

Bucket Shop (*bŭk'ẹt shŏp*), a place maintained for placing bets on the fluctuation of market prices of stocks, grain, or other commodities. The methods of operation are nominally those of brokerage, the difference being that the bucket shop does not actually buy or sell the articles. Such an establishment is considered a gambling place, and the operation of bucket shops is prohibited by most states of the U.S.

Buckeye (*bŭk'ĭ*), an American name for trees and shrubs which are also called horse chestnuts. All belong in the genus *Aesculus,* in the horse chestnut family. They range in size from small shrubs to trees 100 ft. in height. The different species of the genus grow wild in temperate regions all across the Northern Hemisphere. Buckeyes have large compound leaves, with several large leaflets all attached to the end of the leaf stalk. The flowers are large, white, red, or yellow, and are produced in large clusters.

One kind, from Greece and Bulgaria, is commonly grown as a shade tree in cities. Both common names, buckeye and horse chestnut, refer to the large brown nuts, which are inedible. Ohio has made the buckeye its state tree and is often called the "Buckeye State."

Buckingham (*bŭk'ĭng-ạm*), GEORGE VILLIERS, 1ST DUKE OF, born in Leicestershire, England, Aug. 28, 1592; assassinated at Portsmouth, Aug. 23, 1628. He was a favorite of James I and Charles I and attained wealth and power under the Stuarts. In 1623 he accompanied Prince Charles, afterward Charles I, in his suit for the Infanta of Spain with the hope of securing a dowry. The mission proved unsuccessful, owing to the arrogance of Buckingham, and involved England in a war with Spain. In 1625 he went to France as proxy for Charles I to marry the Princess Henrietta Maria. The following year he was impeached on account of the Cadiz expedition, but remained safe in the favor of the king. His unpopularity involved England in war with the French, by whom he was defeated at the Isle of Rhé (Ré) in 1627. His son, also GEORGE VILLIERS, was the 2nd Duke of Buckingham, a politician, courtier and writer, born in London, Jan. 30, 1627; died in Kirby Moorside, Yorkshire, England, April 17, 1677. He favored the royalists during the uprising of 1648 and fled to the Continent with Charles II, where he was the monarch's privy councilor. After the Restoration, he became the most powerful of Charles' courtiers and was a member of the Cabal (*q.v.*). Shrewd, quarrelsome, and dissolute, he was at the center of all court intrigues. At the same time, he was a highly cultured and learned man, the author of plays, poetry and religious tracts. His "The Rehearsal" (1671) is a celebrated satire on heroic drama. His collected works were published in 1704.

Buckingham Palace, a palace in London, England, the residence of English sovereigns since 1837. Located opposite St. James' Park, it was built by the Duke of Buckinghamshire in 1705 and purchased by George III in 1762. Notable features are the magnificent ballroom and throne room and a valuable collection of paintings, including many portraits of the royal family.

Buckinghamshire, an inland administrative county in south central England; area, 749 sq. m. The Thames River forms its southern boundary with the counties of Surrey and Berkshire. In the south lie the chalky Chiltern Hills, and to the north is the fertile Vale of Aylesbury. It is primarily an agricultural region, cattle and sheep are raised; and there are several industries, including furniture manufacture, glassmaking, and tanning. Extensive pre-Roman and Roman remains dot the county, which was once part of the Anglo-Saxon kingdom of Mercia. Buckingham is the chief town of the county. Population, 1951, 386,164.

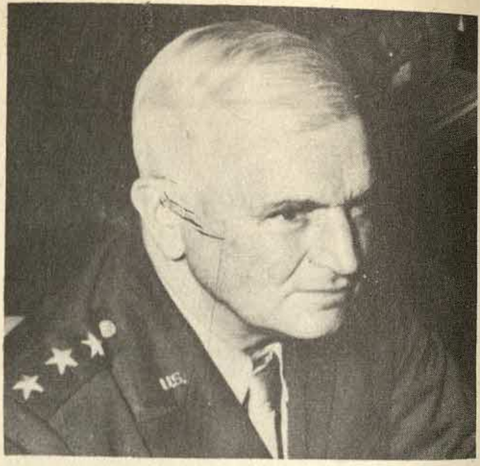
Buckland (*bŭk'lạnd*), FRANCIS TREVELYAN, naturalist, born in Oxford, England, Dec. 17, 1826; died in London, Dec. 19, 1880. He was educated at Christ Church Coll., Oxford, studied medicine, and was surgeon at St. George's Hospital, London. In 1865 he established an institution for promoting fish culture at South Kensington, which was afterward enlarged into the International Fishery Exhibition. His writings include "Curiosities of Natural History" (1857), "Natural History of British Fishes" (1881), and

"Log Book of a Fisherman and Zoologist."

Buckland, WILLIAM, geologist, born in Devonshire, England, in 1784; died Aug. 14, 1856. He was educated at Oxford, where he afterward became distinguished for his researches and lectures on geology and mineralogy. He produced many able writings on those subjects and published several books. Besides lecturing at Oxford, he was prominent in an official capacity in several noted associations. His son, Francis Trevelyan Buckland (*q.v.*), became a noted naturalist.

Buckle (*bŭk'k'l*), HENRY THOMAS, historian, born in Kent, England, Nov. 24, 1821; died May 29, 1862. He inherited a fortune from his father, who was a merchant and shipowner, and devoted himself to the study of science and history. His private library was one of the finest in England. In 1861 he went on a tour to Asia and died at Damascus. His chief work is a philosophic production entitled "History of Civilization in England."

Buckner (*bŭk'nēr*), SIMON BOLIVAR, JR., soldier, born near Mumfordville, Ky., July 18, 1886; died June 18, 1945. The son of a lieutenant general in the Confederate Army, he attended Virginia Military Inst. (1902-04), and was then appointed to West Point, graduating in 1908. His duties took him to Texas, to the Philippine Islands, to Washington, D.C., and back to the Philippines. Returning from his second overseas post, he took graduate work at the Ft. Benning, Ga., Infantry School. After graduating in 1924, he commanded army schools in various parts of the U.S. While serving as chief of staff for the 6th Division, he was raised to brigadier general (1940). The same year he was given command of U.S. troops in Alaska, where he was stationed at the outbreak of World War II. After defending the Aleutians against the Japanese, Buckner was sent to the central Pacific theater of war. He was killed on June 18, 1945, at the height of the Okinawa campaign by a Japanese sniper.



Army Signal Corps Photo

SIMON BOLIVAR BUCKNER, JR.

Bucktails (*bŭk'tālz*), a name familiar in the politics of the State of New York, which originated from the fact that the members of the Tammany Society wore bucks' tails as badges. It came into use about the time of the War of 1812, when the Democratic party was divided into two factions, one headed by James Madison and the other by De Witt Clinton, who were rival candidates for President. When Clinton was elected governor

BUCKINGHAM PALACE

Courtesy British Information Services, N. Y.

of New York, in 1816, those who opposed him were known as Bucktails and his supporters were called Clintonians. The Bucktails gained control of the Democratic state organization under the leadership of Martin Van Buren, and the state administration was styled "Albany Regency."

Buckthorn (*bŭk'thôrn*), the name of a class of shrubs and trees common to Europe and America. The common buckthorn has serrated leaves and produces a berrylike drupe, containing seedlike nutlets. The berries are used as a cathartic, and the bark is employed in medicine and for making a yellow dye. The wood yields a light charcoal used in making gunpowder. Many species of this class of plants have been described. The *alder buckthorn* is common in southern Europe, and grows to a height of from 6 to 10 ft.

Buckwheat (*bŭk'hwēt*), a plant native to eastern Europe and central Asia. It was first brought to western Europe by the Crusaders and is now extensively cultivated in many countries. Buckwheat is grown quite extensively in the U.S. and Europe, owing to its ability to yield abundantly without much attention, even on stingy soil. The seed weighs about 48 pounds per bushel, and 40 bushels per acre is a fair crop. It flowers profusely, is a favorite plant for the honey bee, and is cultivated largely to feed bees. In Europe the seed is ground into flour and used for gruel, breakfast cakes, and bread. In Canada and the U.S. it is used extensively for cakes, which are considered a great delicacy for breakfast. The annual production in the U.S. aggregates 14,750,000 bushels, New York and Pennsylvania producing about two-thirds of the total yield. Canada is peculiarly fitted for the cultivation of buckwheat. Ontario, where the production is largest, has an annual output of about 2,750,000 bushels.

BUCKWHEAT

a, b, Flowers; c, Seed

Bucyrus (*bū-sī'rŭs*), county seat of Crawford County, Ohio, on the Sandusky River, about 65 m. N. of Columbus. It is on the Pennsylvania and other railroads, and is surrounded by a fertile farming country. The city has manufactures of highway-construction machinery, copper kettles, castings, and burial vaults. Bucyrus was first settled in 1819, became the county seat in 1830, and was incorporated as a city in 1885. Population, 1900, 6,560; in 1930, 10,027; in 1950, 10,327.

Bud (*bŭd*), the germ of the future leaves, branches, or flowers of plants. When large enough to have its parts distinguishable, it is seen that the bud is formed of undeveloped leaves. Large buds that are to remain over winter are covered by protecting scales, within which the life of the plant is stored, much the same as the embryo in seeds. The plumule of the embryo is a bud that makes the main stem, which is carried on year after year by a bud called the *terminal bud*. The buds that are to form the branches appear on the side of the stem, at the axils of the leaves, and are called *axillary buds*. The leaf buds contain the rudiments of the leaves and are classed as *leaf buds* and *flower buds*, the flower being a modified leaf bud.

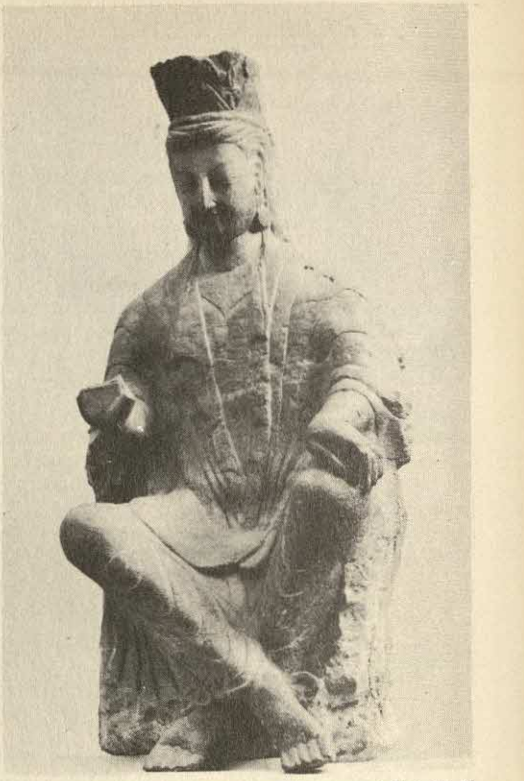
Budapest (*bōō-dȧ-pĕst'*), the largest city and the capital of Hungary, the second largest city in the former empire, located on both sides of the Danube River. It was the imperial capital of the kingdom of Hungary, and as one of the capitals of the dual empire it was of minor importance, since only the two delegations met alternately here and at Vienna. Its name was derived from Buda and Pesth, formerly two cities, but since 1873 united as one municipality. The two parts of the city are united by many bridges across the Danube. It was the seat of an imperial residence, has excellent transportation facilities by the Danube River and a large number of important railroad lines, and is the center of a vast commercial trade. It ranks as one of the important cities of Europe, being a center of wealth, industry, and intelligence.

The city is famous for its beauty, especially along the banks of the Danube, and for its gaiety. Andrassy Strasse, one of the thoroughfares, has an underground road. It is considered one of the loveliest streets in the world, having tall and well-constructed buildings on both sides. The new House of Parliament is an excellent structure, and, besides it, there are the Jewish Synagogue, the Leopold Basilica, a magnificent royal palace, excellent public schools, and other buildings devoted to higher education, including colleges and universities. The library contains 480,000 volumes and 65,000 manuscripts. There are well-improved boulevards, public baths, and healthful mineral springs. The botanical gardens and public parks are among the most beautiful, while its promenades and stone quays along the Danube are delightful. Prior to World War II the Univ. of Budapest had 482 lecturers and professors and was attended by approximately 4,000 students.

The chief manufactures consist of gold, silver, copper and iron wares, leather, silk, and woolen goods, tobacco, beverages, and machinery. It is one of the largest milling centers of Europe. Its sulphur springs make the city a gathering place for many visitors to its baths. The language spoken is Hungarian, but the city has a considerable Bohemian and German population. Buda surpassed the population of Pesth in 1799; at that time the two cities contained a total population of a little over 50,000. Buda was known to the Romans as Aquincum; it was made the capital of Hungary by Matthias Corvinus in 1444. Pesth was founded by the Germans in the 13th century. It became the capital of Hungary after the *Ausgleich* of 1867. During World War II, Budapest was fiercely contested. Made a stronghold by the Germans in their eastern defense system, the city fell to the Red Army after a 50 days' siege, Feb. 13, 1945. Population, *ca.* 1,250,000.

Buddha (*bŏŏd'ȧ*), the founder of Buddhism. He was of Aryan descent, son of the King of Kapilavastu, an ancient kingdom about 100 m. N. of Benares. His family name was Gautama and his personal name Siddhartha, and is often called Sakya-Muni or St. Sakya, meaning a sainted sage. The Chinese call him Fo, which is the name Buddha. The Aryan invaders of India were unfavorable to the religion of the Brahmins and developed the system of castes to keep their blood uncontaminated. Buddha possessed a great human sympathy, broke through the restraint of castes, and though himself an Aryan, he preached the equality of races, a doctrine which was at once embraced by the oppressed Turanians. Some writers place his birth at 622 B.C., and assign his attaining to Buddhahood to the year 580. His death is placed at 483. Buddha did not deify himself, but was assigned to that high rank by his admiring followers. He is represented as a thoughtful personage. His father married him to a charming princess and surrounded him with wealth and splendor in order to prevent him from following a religious life. However, he engaged in a strict religious life after 12 years. At the age of 30 he cut off his long locks, studied the religion of the Brahmins, and attained to much knowledge and skill in religion and history. His conclusion was that ignorance is the cause of evil, and to get rid of it is to attain to perfection, thus becoming freed from all misery. He first preached his gospel at Benares, but later traveled for 40 years in North India, where he gathered many converts and established a vast following. See *Buddhism.*

Buddhism (*bŏŏd'iz'm*), a religion which developed in India during the last centuries before Christ and prevailed there for more than a thousand years, but which today has the majority of its followers in China, Burma, Japan, Tibet, and Ceylon. In its real essence it cannot be considered an original religion but rather a reform movement which originated in Brahmanism (*q.v.*), but in some respects turned against it. It was developed by Buddha, who, historically, was the prince, Siddhartha. Buddha probably died in 483 B.C. at about the age of 80. However, he is not the only Buddha which in Sanskrit (*q.v.*) means "the awakened." There can always be human beings who can be completely purified by an ethically faultless life in combination with the ability to recognize the divine truths.



Courtesy Metropolitan Museum of Art, N. Y.

BUDDHA

Wei Period, 450-500 A.D.

Like the lives of Moses, Christ, Mohammed, and Zoroaster, the history of Buddha's earthly existence has been written down and contains certain elements which we can also find in the lives of the previously mentioned religious leaders. Like them, he himself did not leave anything written by him personally.

The kernel of Buddha's teaching is, as in Brahmanism, the idea that the world is evil and that therefore only complete separation from worldliness leads toward the absolute divine being. The melting into this godly being is identified with the Nirvana, which means a state of nonexistence. Existence itself is always connected with pain and sin. Nirvana can be achieved by completely giving up any desires and passions, and complete self-renunciation. The individual personality has to be wholly extinguished.

The essence of Buddha's teaching is contained in his *Four Great Truths,* which are as follows: *First,* suffering and pain cannot be separated from any form of existence. *Second,* existence itself is produced by the desire to exist and the fulfillment of this desire. *Third,* existence can be abolished only by abolishing the desire for existence which will also abolish pain. *Fourth,* the way to abolish existence is not to desire existence. This way can be found by resignation and self-denial. It will occur in four stages which are developed in simple prescriptions to bring with them the control of emotions and desires, annihilation of ignorance and doubt, of evil and vexation. The last of these four stages is that of Buddha, or the perfect state. Nirvana, once attained, means that no reincarnation is necessary as Brahmanism supposes. No action in itself can be good; only not to act can be good. Thus, logically, Buddha's commandments are necessarily negative ones: Do not kill, do not steal, do not commit adultery, do not give way to drunkenness. The resemblance to the Ten Commandments is obvious. Benevolence is considered the greatest virtue. Only the Buddha can achieve Nirvana. All the others who cannot achieve it will be reborn. In their reincarnation they have to follow the same prescriptions in the hope that their consecutive reincarnations will be on a higher level.

Courtesy Canadian Pacific Steamships, N. Y.

VIEW OF OLDEST BUDDHA TEMPLE IN INDIA

Mounds such as this, called topes or stupas, are built to house relics of the Buddhas, to indicate a sacred site, or for the burial of priests

The teachings of Buddha began to be interpreted in various ways very soon after his death, corresponding to the personalities of his various disciples. As in the Catholic Church, there were very soon councils which tried to explain and reconcile the different shades of opinion and, as in Christianity, Buddha's words were put down only following an interval after his death.

The various sects differ essentially in the following: Some believe that virtuous life and serious thinking are sufficient. Another school uses the "Great Vehicle" Mahayana, emphasizing meditation in the belief that meditation develops supernatural forces. A third group originating, not like the first two in India, but in central Asia, believes that certain supernatural spirits have to aid human beings, otherwise even a virtuous life and meditation will not help. This concept, of course, opened the door to all kinds of superstitions.

Tsong-kha-pa in the 14th century created that form of Buddhism in Tibet, and it today has a great number of followers there. The belief in Buddha and in potential other Buddhas and their specific qualities as described above is essential. Prayer and confession are decisive. Reincarnation is imagined as happening in certain steps comparable to Purgatory, Paradise, etc. However, the un-Christian idea of Nirvana always remains as the first principle. The Dalai Lama in Tibet lives on a level of incarnation higher than that of any human beings. See *Lamaism*.

The historical development of Buddhism ranges from a high form of abstract philosophy which gained great influence in Europe to the crudest form of superstition (prayer-mills). In its innermost principle Buddhism has, of course, to deny the existence of caste.

Though originally Indian, Buddhism conquered Ceylon in the 3rd century before Christ. In China and Tibet it appeared during the 1st century after Christ; in Japan still later.

A major difference between Buddhism and Western religions is in its lack of a personal god. See also *Ethics*.

Budding (*bŭd′ĭng*), a form of grafting in which a leaf bud is used instead of a young shoot. It is preferred for plants that throw out much gum when wounded, as the cherry, peach, plum, and apricot, and also for roses and flowering shrubs. It is done by cutting a bud from one plant and inserting it in some species closely allied. The bud is inserted into an incision, shaped like the capital T, in the stock of the allied tree, and then tied round by a ligature of matting. See *Grafting*.

Budget (*bŭj′ĕt*), a general financial statement which comprehends the proposed measure of expenditures for the ensuing year. "Balancing the budget," or keeping within the limitations set up, may refer to an individual or a group, such as a club or a government. In the U.S., in addition to state budget systems, there is the Federal *Bureau of the Budget*, which compiles estimates to aid the President in submitting to Congress his annual budget for the nation, including a Treasury report, past expenditures and receipts, and recommendations for the ensuing year.

See also *Domestic Economy*.

Buell (*bū′ĕl*), DON CARLOS, military officer, born near Marietta, Ohio, March 23, 1818; died in Rockport, Ky., Nov. 19, 1898. He was graduated from the U.S. Military Acad. in 1841, became first lieutenant in 1846, and won the brevet of captain at Monterrey (1846) and that of major at Contreras and Churubusco (1847), where he was slightly wounded. After the Mexican War he became an officer in Washington, D.C. He remained there until 1861, when he was appointed brigadier general and helped to organize the Army of the Potomac. He then commanded the Army of the Ohio, about 100,000 men. In 1862 he became major general of volunteers and operated with Maj. Gen. Halleck in the South. He came to the aid of Gen. Grant at Shiloh and succeeded in pressing Beauregard toward Corinth. He resigned his commission in 1864.

Buena Vista (*bwā′nä vēs′tä*), a small town in northeastern Mexico, in the state of Coahuila, noted for a celebrated battle between the American forces under Gen. Taylor and the Mexicans under Gen. Santa Anna. It was fought on Feb. 22 and 23, 1847, and the Mexicans were totally defeated, owing to poor generalship. The American army numbered 4,767 and the Mexican 17,000. The American loss was 648, while the Mexicans lost nearly 2,000.

Buenos Aires (*bwā′nōs ī′rēz*), largest city of South America and capital of Argentina, on the La Plata River, 160 m. from the ocean. The

KAVANAUGH BUILDING, BUENOS AIRES

One of the tallest buildings in South America

Courtesy Moore-McCormack Lines, Inc., N. Y.

cultural, industrial, and commercial center of Argentina, the city has a predominantly European flavor. Surrounded by Buenos Aires province (area, 118,752 sq. m.; pop. est., 1955, 5,023,264), the city forms a separate federal district (area, 56.4 sq. m.) and is governed by a mayor appointed by the president and confirmed by the Argentine senate. The province, with its capital at La Plata, is primarily agricultural, producing cattle, grain, and dairy products. The city is largely industrial, and meat packing, flour milling, printing and publishing, and tanning are major enterprises; manufactures include by-products of the meat industry, textiles, and machinery.

The city of Buenos Aires is connected with the interior cities of South America by rail, and there is an airport at Morón, 12 m. from the capital. The port of Buenos Aires, second only to New York City in the Western Hemisphere, was manmade to handle oceanic and river transport.

The national capitol, dedicated in 1906, is at the end of the Avenida de Mayo, the city's principal business thoroughfare. Calle Florida is a fashionable shopping street, and Calle Rivadavia extends beyond the city limits, dividing the city into two almost equal parts. The Cabildo, once the seat of the municipal council and now a historical museum, the cathedral, and the government palace, called the Casa Rosada, or Pink House, are of historical interest. The Univ. of Buenos Aires, founded in 1821, is one of the leading institutions of higher learning in the Americas. The Free Univ. offers adult education for working people. The city maintains national museums of fine arts, natural history, and history; the Colón Theater—the opera house; and botanical and zoological gardens in Palermo Park.

Buenos Aires was founded in 1536 by Don Pedro de Mendoza, but, because of the hostility of the Indians, the first permanent settlement was not made until 1580. By the 17th century, the city and province had become a center of power in southern South America; the province was set apart in 1617, and the city became the capital of a viceroyalty in 1776. Buenos Aires was the focus of the rebellion against Spain in 1810. Its paramount position was disputed by the other provinces of Argentina, and even after 1853, when a stable government was founded, the city's power was a source of dissension. Finally, in 1880, the city was made a federal district, and the capital of the province was moved to La Plata. Population, 1955 (est.), 3,582,561.

Official Netherlands photo

WATER BUFFALO OF JAVA

Buffalo (*bŭf'ə lō*), one of several related oxlike mammals, belonging to the family Bovidae (see also *Ruminants*). The buffalo (*Bubalus bubalis*) of Asia is native to Indo-China, Ceylon, India, where it is still hunted as a game animal, and the Malayan Peninsula. Referred to as the Asiatic buffalo, the carabao, or water buffalo, it is fond of wallowing in the mud and is often found up to its neck in water trying to escape biting insects. Vicious in the wild state, it has been domesticated for centuries and is a remarkably docile draft animal. Short-haired and gray to black, the water buffalo has large horns which project out from its head, forming a shallow curve and extending over the animal's back. A bull stands about 5 ft. at the shoulder. The tamarao, a smaller wild type, is found in the Philippines, and a still smaller type, the brownish-black anoa, is native to the Celebes. The Cape buffalo (*Syncerus caffer*) is found largely in South Africa, where it is hunted for its magnificent head. About the same size as the water buffalo, but stockier and heavier in the shoulder, it is noted for its ferocity. Its horns originate in a broad, shieldlike formation on the top of the head, curving sharply back and tapering to the tips. The outside curve of one horn may measure *ca.* 3½ ft. For the so-called American buffalo, see *Bison*.

Buffalo, a city and port of entry in western New York, the "City of Good Neighbors," seat of Erie County, and the second-largest city in the state. A key city of the Great Lakes, Buffalo is located 290 m. E. of Detroit, Mich., on the eastern edge of Lake Erie and the western end of the New York State Barge Canal. It is an important St. Lawrence Seaway port and is also the headquarters of a customs collection district. Within corporate limits, the Buffalo land area is 39.4 sq. m. The water area of the harbor and riparian rights increase the area to 50.2 sq. m. Corporate limits have increased less than 1 sq. m. since 1854, due to the local autonomy of nearby communities. Rising gently from the shores of Lake Erie, Buffalo ranges to 685 ft. above sea level.

The city's landmarks include St. Paul's Cathedral (Protestant Episcopal); Memorial Auditorium, with 125,000 sq. ft. of exhibit space, seating 15,000 in the main arena; Civic Stadium; and the civic center, Niagara Square, with its obelisklike McKinley Monument and couchant marble lions. A few blocks east is Main St., the chief thoroughfare of the city. Buffalo devotes more than 3,000 acres to public grounds. Of the many parks in the city, Delaware Park and Humboldt Park are the largest, both more than 300 acres in extent. The Prudential Building (1894) is a fine example of the work of the American architect Louis H. Sullivan.

TRANSPORTATION: Buffalo is one of the largest rail centers in the U.S., with a great number of freight and passenger terminals, operated by several lines, including the New York Central, Pennsylvania, Nickel Plate, Baltimore & Ohio (freight) and Lehigh Valley (freight) R.R.'s, and others. The Greater Buffalo International Airport lies about 9 m. E. of the city.

More than $400,000,000 has been invested in Buffalo's 37-m. water front, including the Buffalo River, the City Ship Canal, and the outer harbor, which is protected by 33,600 ft. of breakwater. Annually, more than 20,000,000 water-borne tons, valued at $1,000,000,000, are handled. Commodities include grain, iron ore, coal, and limestone. Thousands of automobiles from Detroit are transshipped each season.

INDUSTRIES: Buffalo is the world's greatest maritime milling center. Site of the first grain elevator, the city currently has more than 35 elevators, with a total storage capacity of more than 50,000,000 bu. About 60,000,000 bu. of wheat alone are milled annually, mostly for flour and breakfast foods. Buffalo produces large quantities of feeds for poultry and dairy and other animals.

The city has a notable diversity of industry. After the grain trade, industries include (in order of importance) steel, iron and steel products, chemicals, motor vehicle and airplane parts, machinery, food, paper and paper products, rubber products, nonferrous metal products, clothing, plastics, electric motors, furniture, drugs, petroleum products, guided missiles, and marine pleasure craft.

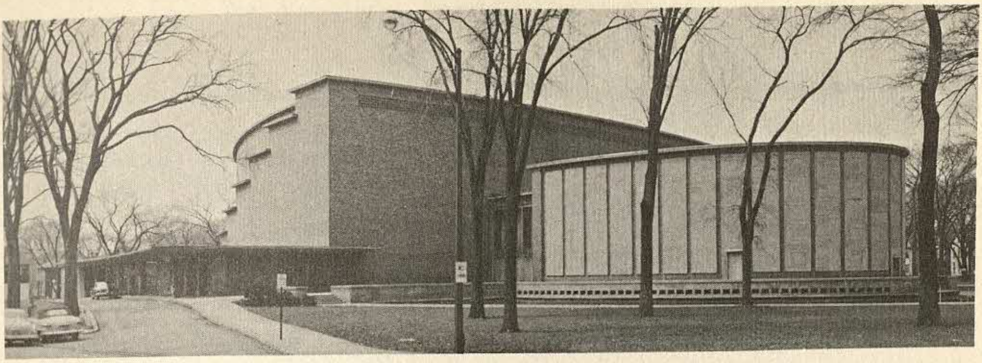
A huge upsurge in industrial production since World War II has been attributed chiefly to the vast amount of research work done by some 200 industries in the area and by such nonindustrial organizations as the Univ. of Buffalo and Cornell Aeronautical Laboratory, Inc.

Buffalo dominates a standard metropolitan statistical area (1,587 sq. m.; pop., 1960, 1,306,957) made up of Erie and Niagara counties; the area's value added by manufacture, 1958, was $1,715,627,000. The city's value added was $692,355,000.

EDUCATION: The public-school system provides education for about 65,000 pupils. Higher education is provided by the Univ. of Buffalo, founded

AIR VIEW OF DOWNTOWN BUFFALO

Courtesy Fitzgerald Airphoto, Buffalo, N.Y.



Courtesy Buffalo Chamber of Commerce

KLEINHANS MUSIC HALL, 1939, DESIGNED BY ELIEL AND EERO SAARINEN

in 1846 as a medical school, but currently providing education in a wide variety of fields, with graduate work and evening courses; Canisius Coll.; D'Youville Coll. (for women); Mount St. Joseph's Teachers' Coll.; Erie County Technical Inst., and a state college for teachers. Related to education and culture are the Albright Art Gallery, featuring a notable sculpture collection; the Museum of Natural Sciences, first to provide a visual running story of every branch of natural science; the Historical Museum, modeled on the Parthenon; and Kleinhans Music Hall.

GOVERNMENT: Buffalo is ruled by a mayor and a 15-man common council. The mayor, comptroller, president of the council, and four councilmen-at-large are elected to four-year terms, and ten district councilmen are elected to two-year terms. Department heads are appointed by the mayor, subject to approval by the council. Buffalo operates under a charter which became effective on Jan. 1, 1928.

HISTORY: Sieur de La Salle (*q.v.*) was one of the first white men to visit Buffalo, about 1679. He built the *Griffin,* the first ship to sail the Great Lakes, on nearby Navy Island. The log-cabin village of Buffalo, settled in 1784 and until 1808 called New Amsterdam, was surveyed and platted by Joseph Ellicott, who is regarded as the founder of the city. The settlement was burned by a force of Indians and British under Gen. Riall in 1813, in reprisal for the destruction by fire of Canadian settlements. The 1,500 villagers fled, but returned to rebuild their homes two years later, and Buffalo was incorporated as a village in 1816 and as a city in 1832. The most important stimulus to Buffalo's growth and prosperity was the opening of the Erie Canal (*q.v.*) in 1825, making the city the western terminus of the waterway and thus one of the few gateways to the West. Two presidents of the U.S. made their homes in Buffalo: Millard Fillmore, and Grover Cleveland. The Pan-American Exposition in 1901, at which President McKinley was shot, focused attention on the city as an industrial as well as a transportation and commercial center.

Buffalo's population increased from 352,387 in 1900 to 580,132 in 1950. It experienced its greatest growth—except for very early days—between 1880 and 1890, from 155,134 to 255,664, an increase of 65 per cent. In 1950 the population was 580,132; in 1960, 532,759.

Buffalo Bill (*bŭf'fȧ-lō bĭl*). See *Cody, William F.*

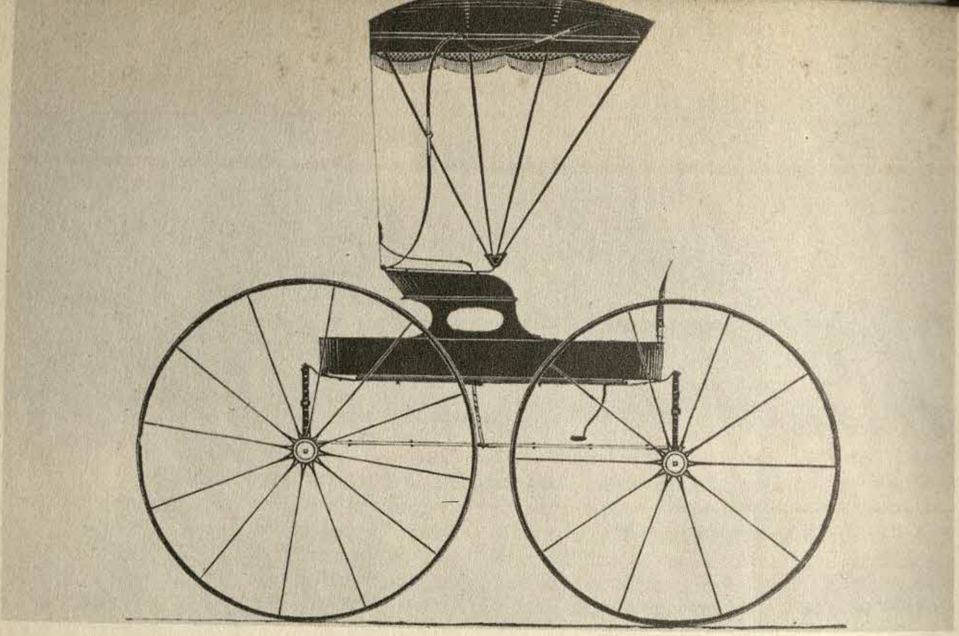
Buffalo Gnat (*năt*), a small insect found in the western section of the valley of the Missouri River and other regions. It attacks human beings and domestic animals but differs from the mosquito in that it bites in the daytime. Swarms of these insects are most frequent when the sun shines brightly and there is no movement of wind. The bites are poisonous. The larva is aquatic and frequents well-aerated water.

Buffalo Grass (*bŭf'fȧ-lō grȧs*), a short grass (4-6 in. high), common to the fertile soil of the western plains of North America, important as pasture for domestic and wild animals. The plants are unisexual, the female producing seed and the male, pollen.

Buff Leather (*bŭf lĕTH'ẽr*), a kind of leather made originally from the skin of the buffalo but now chiefly from hides of cattle. It is naturally of a light-yellow color but is sometimes bleached white or tanned and stained a dull yellow or dark brown. When dressed with oil, it becomes soft and does not easily crack or rot.

Buffon (*bü-fôn̲*), GEORGES LOUIS LECLERC, COUNT DE, naturalist, born in Montbard, France, Sept. 7, 1707; died in Paris, April 16, 1788. He studied for the law but traveled and later devoted himself to science. He was elected a member of the Acad. of Science in 1739 and later made superintendent of the Royal Gardens of Paris. His best-known works include "Natural History," "Epochs of Nature," "History of Birds," and "History of Minerals." The works of Buffon have exercised a wide influence in nature study, and his researches laid a foundation on which Cuvier and others built their systems.

Bug (*bŭg*), in popular language, any small in-



Courtesy Metropolitan Museum of Art, N. Y.

DEEP-SIDED BUGGY, ABOUT 1860

sect or similar creature. Technically, the term bug refers to an insect of the order Hemiptera (*q.v.*). Some of the more common true bugs are the bedbug, which lacks wings, the squash bug, stink bug, water strider, back swimmer, chinch bug, which is destructive to grain, and the so-called kissing bug. Some species of kissing bugs in South America transmit Chagas disease, a type of trypanosomiasis (a blood infestation). The body of a typical bug is usually flattened, with mouth parts fitted for piercing and sucking. Bugs undergo gradual metamorphosis (*q.v.*).

Bug (*bŏŏg*), the name of two rivers in eastern Europe. (1) The northern Bug rises in Galicia east of Lwów, Poland, flows north-northwest to Brest-Litovsk, where it turns west to fall into the Vistula *ca.* 25 m. below Warsaw. Its total course is *ca.* 450 m. and it is navigable from Brest-Litovsk downward. (2) The southern Bug rises in the western part of the Ukrainian S.S.R., flows southeasterly for *ca.* 465 m., and discharges into the estuary of the Dnieper.

Bugeaud (*bü-zhō′*), THOMAS ROBERT, soldier and statesman, born in Limoges, France, Oct. 15, 1784; died in Paris, June 10, 1849. A soldier from the age of 20, he served at Austerlitz, Jena, Eylau, and in the Peninsular War. With the first restoration he was promoted to colonel, but during the Hundred Days he rejoined Napoleon I and after Waterloo remained in retirement for 15 years. Elected in 1831 to the Chamber of Deputies, where he vigorously opposed democratic theories, he was re-elected in 1834, 1837, and 1839. Brilliant strategy in the Algerian campaigns of 1836 and against Abd-el-Kadr (*q.v.*) led to his appointment as governor-general of Algeria. He was later made a marshal of France and Duke of Isly. He resigned his governorship in 1846 because of disagreements with Paris on Algerian policy and later declined to run against Louis Napoleon for the presidency. France owes its possession of Algeria largely to his military skill.

Bugenhagen (*bōō′gęn-hä-gęn*), JOHANN, also known as POMERANUS, Protestant reformer, born near Stettin, Pomerania, June 24, 1485; died in Wittenberg, April 20, 1558. Ordained in 1509, he preached at Treptow until 1521, when he went to Wittenberg to become professor of theology. His best-known work, the *Interpretatio in Librum Psalmorum* (1523), belongs to this period. A friend of Phillip Melanchthon and Martin Luther (*qq.v.*), he assisted the latter with his translation of the Bible and himself translated the Bible into Low German (1533). As a controversialist and as an organizer, he greatly influenced the spread of the Reformation.

Buggy (*bŭg′ĭ*), a light four-wheeled vehicle, commonly equipped with a folding top, drawn by one or two horses. Its lightness and convenience made it equivalent to the doctor's coupé in pre-automotive, or "horse-and-buggy," days.

Bugle (*bū′gl*), a wind instrument commonly made of brass, allied to the trumpet and the cornet (*qq.v.*). Its limited range and its sharp, clear tones made it a common device for military signaling. In garrisons and on shipboard it has now been largely superseded by the loudspeaker, and in warfare by radio communication.

Buhl (*bōōl*), ANDRÉ CHARLES. See *Boulle, André Charles.*

Building (*bĭld′ing*). See *Architecture; Housing.*

Building and Loan Association. See *Savings and Loan Association.*

Buisson (*bwē-sôn′*), FERDINAND ÉDOUARD, educator and statesman, born in Paris, France, Dec. 20, 1841; died in Oise, Feb. 16, 1932. A liberal from his youth, he held various positions in the ministry of education and helped evolve the modern French system of free, secular, and compulsory instruction. He was professor of the science of education at the Sorbonne (1896-1901) and a Radical-Socialist member of the Chamber of Deputies (1902-14, 1919-23); in politics he supported progressive movements, including woman suffrage and proportional representation. Buisson early became interested in world peace; as early as 1867 he had attended an international peace congress at Geneva, and he was one of the earliest advocates of a league of nations. For his persistent efforts in this cause, he was awarded (with Ludwig Quidde, *q.v.*) the 1927 Nobel Peace Prize.

Bukhara (*bo͞o-ḳä′rä*), or BOKHARA, the name of a district of the U.S.S.R. and of the capital of that district. (1) The district, once the Khanate of Bukhara, of some 83,000 sq. m., occupies an area to the north of Afghanistan and west of the Pamir Mts. It is largely desert, but the Amu Darya and Zeravshan rivers and various oases permit the cultivation of grains, fruit, cotton, and other crops. The original inhabitants were Aryans, but the country was conquered by Cyrus and Alexander the Great (*qq.v.*) and by the Altai Turks, who left a lasting influence. Arabic and Persian conquests in the 8th century made it Islamic; the Seljuk Turks, Genghiz Khan, and Timur also held it in succession until it was taken over by the Uzbeks (*ca.* 1500). In 1868 it became a Russian protectorate; in 1920 it became a People's Soviet Republic and in 1924 was merged into the Uzbek Soviet Socialist Republic (*q.v.*).

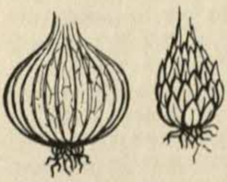
(2) The city, an important trading center, is situated in an oasis *ca.* 140 m. w. of Samarkand. It was founded in 830, and after a succession of conquests became, in the 16th century, the capital of the khanate and a center of Islamic culture. Essentially an Oriental city, marked by mosques and narrow streets, it is served by a branch of the Trans-Caspian Ry. from the newer Russian city of Kagan a few miles away. Its trade is largely in the characteristic goods of the area, karakul, textiles, and rugs. Population, *ca.* 50,000.

Bukhari (*bo͞o-ḳä′rī*), MOHAMMED IBN ISMĀ′ĪL AL-, Arabic scholar, born in Bukhara, July 21, 810; died in Kartank, near Samarkand, Aug. 31, 870. The son of a Persian family, he began studying Islamic traditions at the age of 11 and at 16 made the sacred pilgrimage to Mecca, thereafter traveling in Egypt and Asia. During 16 years of travel, he collected more than 300,000 traditions about the words and deeds of Mohammed (*q.v.*). Of these, he published 7,275 as *al-Sahīh* ("the true" or "the genuine"), which became one of the sacred books of Islam.

Bukharin (*bo͞o-ḳä′rin*), NIKOLAI IVANOVICH, revolutionary, born in Moscow, Russia, Oct. 9, 1888; died (executed), March 13, 1938. Educated at the Univ. of Moscow, he was active in the revolt of 1905 and in 1906 joined the Bolshevik, or radical, faction of the Russian Social-Democratic party. He worked for a time with Lenin and later visited Scandinavia and the U.S. Returning to Russia after the revolution in 1917, he became a member of the central committee of the Communist party. He was prominent in party leadership for ten years but in 1929 was expelled for deviation from orthodox Marxian doctrine. Restored to membership in 1934, he then edited the Moscow newspaper *Izvestia* until he was arrested, with a group of other "old Bolsheviks," on charges of conspiring with internal and external enemies of the Soviet Union. Bukharin wrote several books on Communism, including "Theory of Historic Materialism."

Bukovina (*bo͞o-ḳô-vē′nȧ*), or BUCOVINA, a region in northeastern Rumania and the southwestern part of the Ukrainian S.S.R. (*qq.v.*), crossed by spurs of the Carpathian Mts. Austria took it from Turkey in 1775 and in 1849 made it a crown province. In 1917, abandoned by retreating Russians who had invaded the region early in World War I, it fell to the Austro-German armies. In 1919 Bukovina became a province of Rumania (capital, Czernowitz, pop., *ca.* 110,000). The northern part of the province was ceded to the U.S.S.R. in 1940, captured by Rumanians in 1941, and returned to Russia in 1944. The original area of the province was *ca.* 4,035 sq. m.; population, *ca.* 850,000.

Bulb (*bŭlb*), a greatly modified bud of a plant, usually produced underground, consisting of a very short vertical stem and many closely packed scale-leaves (or bases of leaves, in some cases) much thickened with stored food. Roots grow from the base; small buds at the tip of the stem, enclosed by the storage scales, grow up into green leaves and flowers. Several other kinds of underground storage organs (corms, rhizomes, tubers, thickened roots) are often called bulbs, although their structure is not the same. Some plants producing true bulbs are daffodil, hyacinth, tulip, lily, onion.



BULBS

Onion (left)
Lily (right)

Bulfinch (*bo͝ol′finch*), CHARLES, architect, born in Boston, Mass., Aug. 8, 1763; died there, April 15, 1844. After being graduated from Harvard Coll. (1781), he toured Europe until 1786. He designed numerous private houses, the first theater in New England, the State House in Boston, and capitol buildings for Maine (in Augusta) and Connecticut (in Hartford). President Monroe made him supervising architect for the reconstruction of the Capitol at Washington, partly burned by the British in 1814. He was long famous and widely imitated for his skillful use of Renaissance elements, and his graceful house fronts (his own, and those of imitators) are still known as "Bulfinch façades."

Bulfinch, THOMAS, author, born in Newton, Mass., July 15, 1796; died in Boston, Mass., May 27, 1867. The youngest of 11 children of Charles Bulfinch (*q.v.*), he attended Phillips Exeter Acad. and Harvard Coll. and held various positions, but was chiefly interested in reading and writing. He wrote numerous books, of which the best known, still widely read, is "The Age of Fable" (1855).

Bulganin (*bōōl-gä′nyĭn*), NIKOLAI ALEXANDROVICH, Soviet official, born in Nizhny-Novgorod (now Gorki), June 11, 1895. After attending secondary school, he worked as a clerk and as a textile worker. In 1917 he joined the Communist party and after the October Revolution he served in the secret police (Cheka). After the firm establishment of the Lenin regime in 1922, Bulganin became a minor official specializing in economic affairs. In 1931 he was named head of the Moscow Soviet of Workers' Deputies (mayor) and, in 1938, became head of the state bank. After working with the military forces during World War II, he emerged as a national figure when he was appointed deputy premier in 1946. He gained the rank of marshal in 1947, succeeding Joseph V. Stalin (*q.v.*) as defense minister. In 1948 he became a full member of the Politburo and in 1949, gave up his duties as defense minister, but he returned to that post after Stalin's death (1953). On Feb. 8, 1955, he succeeded to the premiership; and in cooperation with Nikita S. Khrushchev (*q.v.*) he expressed Soviet willingness to establish "co-existence" with the Western nations but avoided making any important concessions. He paid an official visit to Great Britain in 1956 and—unlike Stalin—frequently traveled to foreign countries to show Soviet good will. On March 27, 1958, Khrushchev succeeded him as premier, reappointing Bulganin head of the state bank, the post which he held from 1938 to 1941.

Bulgaria (*bŭl-gä′rĭ-ȧ*), a nation of Europe, in the eastern part of the Balkan peninsula. It is bounded on the E. by the Black Sea, S. by Greece and Turkey, W. by Yugoslavia, and N. by Rumania. The Danube River marks most of Bulgaria's northern boundary. The country has an area of 42,796 sq. m.

DESCRIPTION. Bulgaria is a mountainous country, embodying parts of the Balkan and Rhodope Mts. The Balkan Mts. include Vitosha (7,517 ft.) and Musalla (9,610 ft.). Most of the drainage is into the Black Sea, principally by the Danube and its tributaries, which include the Lom, Vit, Osam, and Ogosta rivers. Rivers flowing directly into the Black Sea include the Devna and the Kamtchik; the Maritza and the Struma flow southward to the Aegean Sea. The eastern boundary of the country is indented by the Gulf of Burgas, an arm of the Black Sea.

The general climate is healthful. The climate in the north is somewhat colder than that in the south, because the high Balkan Mts. obstruct the flow of Mediterranean winds. Temperatures range from −8° to 90° F., with an average of about 50°. The valleys are mostly treeless, but the mountains are heavily forested. Wild animals include deer, bear, wolf, boar, and many species of birds.

INDUSTRIES. Approximately 80 per cent of the population is engaged in agriculture, mostly on holdings of five acres or smaller, with primitive facilities. About half of the nation's 25,500,000 acres are tillable. Fruits, especially grapes, are grown in abundance. Other products include cotton, sugar beets, tobacco, vegetables, and small grains. Domestic animals are raised in considerable numbers. Mines are owned and operated by the government; coal is the principal product, although there are also workable quantities of salt, bauxite, petroleum, and some metals.

TRANSPORTATION AND COMMERCE. Canals and rivers, particularly the Danube, are important for transport and, with the seaports, provide the principal trade routes. There are about 2,200 m. of railroads and 14,000 m. of highways. Foreign trade is controlled by the government; exports are slightly larger than imports.

POPULATION. The people of Bulgaria represent a southern branch of the Slavic stock, whose occupation of the area dates to about the 5th century, and who assimilated a wave of Bulgars, an Asiatic people from the Volga steppes, in the 7th century. Some Greeks and other neighboring groups are represented, although not in large numbers. About 87 per cent of the people speak Bulgarian, 10 per cent Turkish. There is no state church; in 1949 some 85 per cent belonged to the Eastern Orthodox Church, 11 per cent were Moslem, and the remaining small percentage were Roman Catholic, Jewish, Protestant, and Armenian Christian. The capital, Sofia (population, *ca.* 437,000), is the largest city. Other important cities include Plovdiv; Stalin (formerly Varna), the country's chief seaport; Ruse; Burgas; and Pleven. The population of Bulgaria at the 1946 census was 7,022,206.

LANGUAGE AND LITERATURE. Bulgarian is a Slavic language, closely related to the languages (Serbo-Croatian, Slovenian, and Macedonian) of Yugoslavia to the west. The standard language is

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ASSEMBLY SQUARE IN SOFIA

STUDENTS IN A VILLAGE SCHOOL

based on the northeastern dialect and written in the Cyrillic alphabet as adapted for Bulgarian. There are many local dialects, those of western Bulgaria shading off into those of eastern and southern Yugoslavia.

The definite article is suffixed and varies for gender and number, *e.g.*, *žena,* meaning woman, changes in the plural to *ženi; ženata* means the woman and *ženite,* the women. Case has been lost except for some vocative forms and the pronouns, thus *az* = I; *meni, mi* = to me; and *mene, me* = me. The verb has personal endings for present (also dependent) and past: *gledam* = I'm looking; *gledah* = I looked. The future uses *šte,* meaning will, thus *az šte gledam* = I'll be looking. There are also other compound verb forms, such as *az səm gledal* or I have looked. Every verb is either perfective (completed action) or imperfective (completeness not implied). Both stress and intonation are important, as in English.

The older literature of Bulgaria is almost exclusively ecclesiastical. It was written in Old Church Slavic, although many influences of spoken Bulgarian appear in the manuscripts. The 19th century saw a literary renaissance in Bulgaria, fostering the use of the actual spoken language. The first major writer was Ivan Vazov (1850-1921), the author of novels, plays, and poems. Aleko Konstantinov won fame outside Bulgaria for his "Bay Ganyu," picturing a peasant's reaction to westernization. In addition to the formal literature, there is also a rich Bulgarian folklore.

Government. Bulgaria was a constitutional monarchy until a referendum in September 1946 voted to depose the king and the national assembly proclaimed the Bulgarian People's Republic. Legislative authority is vested in a one-house national assembly, elected by direct, secret, and universal vote for a four-year term. The legislature in turn elects the ministers and a collective body called the presidium, which is the highest organ of the state. The presiding officer is a premier. For local administration, the nation is divided into seven regions, subdivided into municipalities and urban districts; councils for these are popularly elected for a three-year term. Judges are elected (and may be recalled) by the people; the legal code in general is based on that of the U.S.S.R. By the peace treaty of 1947, the army of Bulgaria is limited to 55,000 men, its naval personnel to 3,500, and its air force to 90 aircraft. Education is compulsory and free for children between the ages of 7 and 15. There are secondary and technical schools, and 13 universities enroll about 40,000 students. There is no state church, but the general religion is that of the Eastern Orthodox Church.

History. The Bulgars, an Asiatic people, overran the country in the 6th century and created a strong local state, but were conquered and annexed by the Byzantine empire in 1018. When that empire fell, the Bulgars came under Turkish domination (1393) until the middle of the 18th century, when a new spirit of nationalism arose. The Turks, opposed to this development, repressed them until a Turkish massacre of Christians in 1876 aroused general European sympathy. Russia, aided by Bulgarian volunteers, freed the nation, which was then declared independent by the Treaty of Berlin (1878).

Bulgaria then chose for its king Prince Alexander of Battenberg, who was authorized to call a constitutional convention. But the hostility of Alexander III of Russia and a domestic revolt forced Prince Alexander to abdicate (Sept. 7, 1886). In 1887 the throne was given to Prince Ferdinand of Saxe-Coburg-Gotha. In 1908, the assembly declared the nation independent of Turkey, and Ferdinand took the title of Czar of Bulgaria. The Balkan Wars of 1912-13 gave Bulgaria an Aegean port at the expense of Turkey but caused some territorial losses to Serbia, Rumania, and Greece. In 1915 Bulgaria entered

World War I on the German side and fought until 1918. The Treaty of Neuilly (1919) cost Bulgaria the territory gained in the Balkan Wars and World War I, in addition to reparations.

On March 1, 1941, Bulgaria joined the Axis nations in a tripartite pact allowing German troops to occupy the country while Bulgarian forces joined the invasions of Yugoslavia and Greece. Great Britain declared war on Bulgaria on Dec. 13, 1941, and the U.S. on June 4, 1942. Upon the death of Boris III (1918-43), his minor son, Simeon II, was crowned under a regency loyal to the Axis nations. But as the Russians drove toward Germany, Bulgaria became a battleground; pro-Allied groups gained power and declared war on Germany (Sept. 8, 1944). After an armistice with the Allies (Oct. 28, 1944), a new government was formed by the Communist-led Fatherland Front, with marked leanings toward the Soviet Union. By the end of 1948, 97 per cent of all Bulgarian industry and mines had been nationalized, the pattern of social control was distinctly Communist, and the nation became a full-fledged satellite state of the U.S.S.R. On Dec. 4, 1947, a new, Soviet-model constitution proclaimed Bulgaria a People's Republic, with a one-party government and alliance with the Cominform (see *Communism*). Nationalization of agriculture, membership in the Russian Council for Economic Mutual Assistance (1949), and acceptance of a unified military command directed from Moscow (1955) were proofs of the continuing Russian orientation of Bulgaria. In 1955 the country became a member of the U.N.

Bulge (*bŭlj*), BATTLE OF THE. See *Germany*: History; *World War II*.

Bull (*bo͝ol*), an edict or decree of the pope. The name is derived from the Latin *bulla*, or seal, by which such documents are authenticated. The term was also formerly applied to decrees of secular rulers, the most famous of which was the *Golden Bull* (1356) of Emperor Charles IV, which regulated the number and privileges of electors and the election of the Holy Roman emperor.

Bull, the male of any species of the genus *Bos*, of which the cow is the female. See *Cattle*.

Bull, JOHN, a personification. See *John Bull*.

Bull, JOHN, musician, born in Somersetshire, England, *ca.* 1562; died in Antwerp, Belgium, March 12, 1628. He became organist of the chapel royal (1591), professor of music at Gresham Coll. (1596), and organist of Antwerp Cathedral (1617-28). He was not only a composer but also a skilled harpsichordist and organist. His work, "The King's Hunt," was one of the first compositions known to be written to demonstrate a player's skill. Much of his music is collected in the "Fitzwilliam Virginal Book."

Bull, OLE BORNEMANN, violin virtuoso, born in Bergen, Norway, Feb. 5, 1810; died in Lysö, Aug. 17, 1880. He showed talent at the age of five, later studied in Paris and Milan, and toured the U.S., Canada, and the West Indies until 1848. After establishing (1850) a national theater in Bergen, he returned (1852) to the U.S., where he spent five years and lost a fortune in attempting to establish a Norwegian colony in Pennsylvania. His last appearance in the U.S. was in 1879. His playing was long remembered for both feeling and technique.

Bulldog (*bo͝ol′dôg*), a medium-sized dog (*q.v.*) originally bred for bullbaiting. This primitive sport consisted of irritating a bull and then setting dogs upon him, one at a time; the sport consisted largely of seeing the dogs tossed. The bulldog is characterized by a thick, short, flat muzzle, a projecting lower jaw, thick lips, half-pricked ears, and a low but thick and strong body. It is favored as a watchdog because of its activity, courage, and intelligence. The *bull terrier*, smaller than the bulldog, is a cross between the bulldog and the terrier. See also color plate, *Types of Dogs I*, Volume IV.

Buller (*bo͝ol′ẽr*), SIR REDVERS HENRY, soldier, born in Devonshire, England, Dec. 7, 1839; died June 2, 1908. Entering the army at the age of 18, he served in China, Africa, and the Sudan and was made an adjutant general in 1890. In full command of British forces in South Africa in 1899, he was superseded by Gen. Frederick Roberts when he failed to relieve the Boer siege of Ladysmith. He retired from the service in 1901.

Bullet (*bo͝ol′ĕt*), a missile, either round or elongated, to be discharged from a rifle, musket, pistol, or the like. It may be of compound construction with an outer metal jacket and an inner core composed of lead alloy or some other substance. It may be loaded separately or as a component of a self-contained metallic cartridge (*q.v.*).

Bullfight (*bo͝ol′fīt*), the national sport of Spain and Mexico. Of primitive origin, it was introduced into Spain by the Moors and has remained popular ever since. In Spain, the bullfighting season runs from March to November; the fights, generally held on Sundays and holidays, take place in a circular arena. Every principal town in Spain has such an arena; the largest in the world is in Mexico City. A bull, bred especially for the game, is first irritated by a minor wound and then released into the ring. Thereupon several *banderillos* dance about him, on foot, waving capes to draw his attention, so as to give the *matador* (also called *torero*), or bullfighter, a chance to appraise the bull's speed and tactics. A *picador*, on horseback, attempts to wound the bull between the shoulder blades; the decrepit horses used for this purpose are sometimes gored. After the picador has succeeded, the

Courtesy Metropolitan Museum of Art, N. Y.

BULLFIGHT. PAINTING BY GOYA (1746-1828)

banderilleros attempt to plant a series of long darts around the wound. The *matador* then undertakes, on foot, a sword combat with the bull. When the bull has been killed, the body is dragged away, the bloody area is sanded over, and another bull is brought out.

Bullfinch (*bo͝ol'fĭnch*), a popular name given to two birds having only a rather general resemblance. The American bullfinch (*Pyrrhuloxia sinuata*) is similar to the American cardinal (*q.v.*) in size and general contour, but it is grayer. It is, therefore, sometimes referred to as the *gray cardinal*, although the forehead, chin, and breast are geranium-red and the wings dark red. It is confined to the hot upland regions of Mexico, Arizona, and adjacent areas. The European bullfinch (*Pyrrhula pyrrhula*) is similar to a grosbeak (*q.v.*). The cheeks, throat, and breast are red, the tail and wings, black. As a cage bird, it can be taught to whistle tunes.

Bullfrog (*bo͝ol'frŏg'*), a large aquatic frog (*q.v.*), belonging to one of several species of the genus *Rana*. Over most of the U.S. and Canada, the common bullfrog is *Rana catesbeiana*. In the Southern states bullfrog refers to *Rana grylio*, and in the Pacific states, *Rana aurora*. The hind legs of all three species are a delicacy, tasting somewhat like chicken. *Rana catesbeiana* closely resembles the common green-headed pond frog (*Rana clamitans*), but it is far larger and it lacks the skin ridges which extend on each side of the back, from behind the eye to the rump, of the pond frog. Bullfrogs eat insects, worms, other frogs, and young birds. Each female lays several thousand very small eggs late in the spring, long after most other kinds of frogs have spawned. The tadpole (immature frog) grows to at least 5 in. in length and requires two years before metamorphosis into the adult. See also *Toads*.

Bullhead (*bo͝ol'hĕd'*), a common name applied to fish of several species of the genus *Ameiurus*, of the family Ameiuridae. These fish are scaleless, with a depressed head, wide mouth surrounded by numerous barbels possessing sensory functions, an adipose dorsal fin, and a square to rounded tail fin. A small fish, the bullhead seldom exceeds 14 in. in length. Its smooth skin is extremely variable in color and may be yellowish, greenish, or blackish. Bullheads typically frequent shallow, weedy parts of freshwater ponds, sloughs, and sluggish parts of streams in the central and eastern U.S. from the Great Lakes southward. They have been planted in some localities on the West Coast. For a time after hatching, the young fish form tight schools guarded by the mother. Bullheads are highly prized for food and, since they take a great variety of baits, they are widely sought by sport fishermen.

Bullion (*bŏŏl′yŭn*), a term usually applied to uncoined gold and silver in plates, bars or other masses; sometimes, however, it designates coined metal valued only as merchandise, as distinguished from its money value. In the U.S., bullion refers to precious metal in bars held in the Treasury as the security against which bank notes are issued.

Bullitt (*bŏŏl′ĭt*), WILLIAM CHRISTIAN, diplomat and public official, born in Philadelphia, Jan. 25, 1891. The son of a wealthy family, he studied political science at Yale Univ. and law at Harvard Univ. and then entered journalism. In 1918 he was sent by President Wilson and British Prime Minister Lloyd George to study the newly formed Soviet Union. After some years out of public life, Bullitt was made (by President F. D. Roosevelt) the first American ambassador to that nation (1933). Later transferred to France, he served there until the French capitulation in 1941. He was then given a post in the U.S. Navy Dept. (1942) and later was military governor of Baden-Baden (1945). He has written several articles and books on international affairs.

Bull Moose Party. See *Political Parties in the United States; Republican Party; Roosevelt, Theodore.*

Bull Run (*bŏŏl rŭn*), a small stream in northern Virginia, a tributary of the Potomac through the Occoquan River, which was the scene of two great battles of the Civil War. The first, sometimes known as the first battle of Manassas (from a near-by church), took place on July 21, 1861, between Gen. McDowell (*q.v.*) with 18,500 Union troops, and Gens. Beauregard and Johnston (*qq.v.*) with 18,000 Confederates. The Union forces at first had the advantage, but were later repulsed in a defeat that amounted almost to panic. This battle earned Gen. Jackson (*q.v.*) his famous nickname of "Stonewall," gave the Southern armies their first great victory, and forced the North to realize that instead of a skirmish the conflict was to be a full-scale war.

The second battle of Bull Run (or Manassas) occurred on Aug. 29 and 30, 1862. General Robert E. Lee (*q.v.*), with some 54,000 men, faced Gen. Pope (*q.v.*) with a force of 63,000 men. McDowell, originally sent to prevent Lee's force from joining Jackson's, was recalled to join Pope. Jackson, at Manassas Junction, took a strong position behind a railroad embankment near Gainesville. General Sigel (*q.v.*) brought the Union forces into attack at daylight on Aug. 29. The battle raged furiously in the forenoon, Pope expecting

THE FIRST BATTLE OF BULL RUN, JULY 21, 1861

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McDowell and Porter to join with reinforcements. However, the afternoon arrived, but Porter never came. The fighting ceased at night and was resumed the next day, but Pope's troops were so wearied that he was compelled to retire. Porter was afterward courtmartialed for his conduct during the battle and dismissed from service. The losses, though never accurately determined, were heavy, about 9,500 for the Confederates and 14,500 on the side of the Federals. Lee took the aggressive immediately after the battle and invaded Maryland. The whole Federal army fell back to Washington in an orderly retreat after Sept. 1, 1862.

Bull Trout (*bo͝ol trout*), the name applied to certain species of fish belonging to the salmon family. They are fine game fish and are frequently mistaken for the salmon, from which they differ in having a body somewhat thicker than that of the salmon. The bull trout of England is found in large numbers in the mouths of rivers and approaches the salmon in size and habits. In some sections of the Rocky Mts., where a fine species is abundant, it is considered a fine game fish, but is more popularly called the *Dolly Varden trout.*

Bülow (*bü'lō*), BERNHARD, COUNT VON, statesman, born in Klein-Flottbeck, Germany, May 3, 1849; died Oct. 28, 1929. After studying in Lausanne, he took courses in the universities of Leipzig and Berlin, and served efficiently in the war of 1870-71 against France. Subsequent to the war he entered the consular service and was secretary of legation at Rome, St. Petersburg, and Vienna, and in 1878 represented the government at Athens, Greece. The Berlin congress of 1878 elected him secretary and subsequently he represented the nation as ambassador to Italy. In 1899 he concluded a treaty with Spain by which the Pelew, Caroline, and Ladrone Islands became German territory. He was made chancellor of the empire in 1900. The imperial expansion policy of Germany was supported by him, and through his influence the position of Germany was strengthened in the Great European War which began in 1914.

Bülow, FRIEDRICH, military leader, born at Falkenberg, Germany, Feb. 16, 1755; died Feb. 25, 1816. He entered the Prussian army at the age of 14 years, was lieutenant at the opening of the war in 1813, and in that year commanded in battles at Möckern and Halle. He succeeded in driving the French out of Westphalia and Holland, and joined the Allies in Paris, where he received the title of Count of Dennewitz, in recognition of his success against Ney at Dennewitz. In 1815 he fought with Blücher at the Battle of Waterloo, and was an important factor in defeating Napoleon. Subsequently he occupied a strategic point at Paris. He was made a Knight of the Black Eagle and a monument was erected to his honor in Berlin.

Bülow, HANS GUIDO VON, distinguished pianist, born at Dresden, Germany, Jan. 8, 1830; died Feb. 12, 1894. He studied law at the Univ. of Leipzig, but showed early aptitude in music. The successes of Liszt and Wagner at Weimar and elsewhere influenced him to intrust himself to the personal instruction of Wagner in 1850. His first musical tour was made three years later. In 1854 he became pianist at the imperial court at Berlin, and 10 years later was made pianist at the Bavarian court. In 1869 he retired for some time to Florence, but soon entered upon great concert tours through Europe and America, and gained a world-wide reputation. On returning to Germany he entered the court of Meiningen as musical director, and became renowned as a director in the Liszt-Wagner school. Among his 30 musical works the following may be mentioned as of high repute: "Nirvana," "Der Sänger's Fluch," and "Overture to Julius Caesar."

Bulrush (*bo͝ol'rŭsh*), the popular name of an aquatic plant. It is rushlike or reedlike, with a cylindrical stem growing from 2 to 10 ft. in height. In many species the sheath bears a small awl-shaped leaf, and the culm is tipped with an erect and pointed leaf. The roots are creeping and have astringent and diuretic properties useful in medicine. In some species the flowers are compound, with small spikes on their sides. The stems and leaves are the most useful parts of the plant, since their toughness renders them of service in thatching and for making chair bottoms and mats. The bulrushes are common to the rivers and ponds of many sections of America and Eurasia. Large tracts of Southern Asia are noted for a prolific growth of these plants, where they are used quite extensively by the natives for thatching cottages.

Bulwark (*bo͝ol'wẽrk*), naval or military term signifying 1) fortification, rampart, or other defensive structure; 2) usually used in the plural, meaning that side of a ship raised above the upper deck.

Bulwer-Lytton (*bo͝ol'wẽr-lĭt''n*). See *Lytton.*

Bumblebee (*bŭm'b'l-bē*), or HUMBLEBEE, a large bee found in nearly all parts of the world, except New Zealand and Australia. It has a hairy body and the tibiae of the hind legs terminate in two spines. The community ranges from 50 to 200. A large number of species have been described, most of which select as a nest some hole in the sod, frequently a deserted mouse nest, or an opening between rocks or in a log. About half of a colony are workers and the remainder are males and females. Rude cells are built by the workers, in which the honey is deposited and at the end of the season all except a few females die. In the spring the fertilized female gathers a mass of pollen and honey and deposits her eggs, and the scant store of honey is laid up by the workers as they mature, while the mother bee confines herself to the task of increasing the numbers of the colony. The females are longer than the males and workers, and they live together in the same colony without attacking each other. These bees are not valuable except that they fertilize plants, and some species of clover depend for their fertilization exclusively upon these insects.

Bunche (*bŭnch*), RALPH JOHNSON, educator, U.N. official, born in Detroit, Mich., Aug. 7, 1904. His graduation from the Univ. of California in 1927 was followed by study at Harvard, where he received an M.A. (1928) and a Ph.D. (1934), and at Northwestern Univ., the London School of Economics, and the Univ. of Capetown (in South Africa). In 1928 he began to teach political science at Howard Univ., later heading the department of political science. In World War II he served with the Office of Strategic Services (1941-44); later he was associated with the State Dept. After serving as assistant secretary to the U.S. delegation to Dumbarton Oaks (*q.v.*) in 1944, and adviser to the U.S. delegation to the U.N. charter conference at San Francisco in 1945, he joined the U.N. in 1946 as director of its trusteeship division. When Sweden's Count Folke Bernadotte was assassinated in 1948 while attempting to mediate Arab-Jewish difficulties in the Holy Land, Bunche, who had been assisting him, became U.N. Acting Mediator. Through his efforts an armistice was arranged. See also *Israel*. In August 1949 Bunche resumed his post as director of the U.N. trusteeship division. In 1954 he was named undersecretary without portfolio and in 1957 undersecretary for special political affairs. In the latter capacity he made several visits to trouble spots in Africa and the Middle East. Among many awards, Bunche was the winner of the 1948 Spingarn Medal and the 1950 Nobel Peace Prize (the 11th American and first Negro to receive the award); in 1963 he received a Presidential Medal of Freedom.

Buncombe (*bŭn'kŭm*), EDWARD, soldier, born at St. Kitts, West Indies; died in Philadelphia, Pa., in 1777. He was educated in England and settled in North Carolina, where a county was named for him in 1791. He fought in the Revolutionary War and became a member of Congress. When an effort was made to cut him short during a speech, he declared that he was "talking only for Buncombe." This phrase, which became well known in the sense of talking only for effect, is commonly shortened to "bunk" or "bunkum."

Bundesrat (*bo͞on'dęs-rät*), the federal council of the German empire (1871-1918). It represented the individual states, the people being represented by the Reichstag. In the (Western) Federal Republic of Germany, formed after World War II, the Bundesrat represents the states and the Bundestag represents the people.

Bundy (*bŭn'dĭ*), MCGEORGE, educator, government official, born in Boston, Mass., March 30, 1919. He was graduated from Yale Univ. in 1940 and served as political analyst with the Council of Foreign Relations (1948-49). At Harvard Univ., he was visiting lecturer (1949-51) and associate professor of government (1951-54); in 1953 he was named dean of the faculty of arts and sciences. He resigned in 1961 to become President John F. Kennedy's special assistant for national security affairs. Bundy helped Henry L. Stimson (*q.v.*) in the writing of "On Active Service in Peace and War" (1948).

Bungalow (*bŭng'gȧ-lō*), the name of a kind of house built in the Orient, particularly in India. Usually only one story high, it is constructed of sun-baked brick with a thatched or tiled roof whose eaves project to keep rain from the earthen walls. The wide eaves provide good shade in the dry West and Southwest, and as the "California bungalow" this type of house, usually built of wood, was long popular in the U.S. The distinguishing marks are a veranda and a medium-pitched roof with extremely wide eaves.

Bunin (*bo͞o'nyĕn*), IVAN ALEXEYEVICH, poet and novelist, born in Voronezh, Russia, Oct. 22, 1870; died in Paris, France, Nov. 8, 1953. His first published work was a volume of poems (1891). He did not achieve fame, however, until the publication of "The Village" (1910; Eng. trans., 1923), a grimly realistic novel of Russian peasant life before the revolution of 1905; it was followed by numerous similar works. Bunin also won note for his translations of Byron, Tennyson, and Longfellow, particularly for his rendering into Russian of Longfellow's "The Song of Hiawatha." His masterpiece is the lengthy short story "The Gentleman from San Francisco" (1916;

IVAN A. BUNIN

Courtesy Metropolitan Museum of Art, N. Y.

BATTLE OF BUNKER HILL

From the painting by John Trumbull (1756-1843)

Eng. trans., 1923), which has as its theme the vanity of material things, a recurring motif in Bunin's work. Other well-known works include "Mitya's Love" (1924-25; Eng. trans., 1926) and an autobiographical novel, "The Well of Days" (1930; Eng. trans., 1933). He was the first Russian writer to win the Nobel Prize in literature, awarded to him in 1933. His novels and stories, which have been compared with the works of Tolstoy, Turgenev, and Chekhov, are succinct and trenchant commentaries on life and human conduct. An anti-Bolshevik, Bunin emigrated in 1919 to live in France.

Bunion (*bŭn'yŭn*), an inflammation and enlargement of the membranous sac situated over the metatarsal joint of the great toe. It is caused by pressure, hence may be attributed to a tight or badly fitting boot or shoe. The attack begins with a small spot which gradually enlarges.

Bunker Hill (*bŭnk'ẽr hĭl*), a small elevation in Charlestown, formerly a city of Massachusetts, now a part of Boston, Mass., and the site of the Battle of Bunker Hill. The battle occurred on June 17, 1775, between the British, commanded by Gens. Clinton, Howe, Burgoyne, and Gage; and the American army, led by Gens. Ward and Putnam, Col. Prescott, and Maj. Brooks. The British army occupied Boston with 10,000 men and intended to occupy Bunker Hill and fortify itself on the neighboring heights. The American army of 15,000 men was stationed at Cambridge.

Hearing of the intention of the British, the Americans hastened to fortify Breed's Hill, near Bunker Hill, and were attacked by the enemy from ships and batteries in Charlestown Harbor. As the British advanced from Morton's Point, the Americans withheld their fire until the British were close upon them. They then made a vigorous defense and repulsed the British with great loss. A second unsuccessful attack was made, followed soon after by the burning of Charlestown. When the British led a third attack, the Americans, whose ammunition was exhausted, resisted with stones and the butts of their rifles. The enemy finally withdrew from the scene of battle but with small loss. The American losses totaled 308 wounded, 30 prisoners, and 116 killed, among them Gen. Warren. The British loss was 1,054. The Battle of Bunker Hill, although unfavorable to the Americans, was actually a victory in that it taught the lesson that the patriots were fired with a great cause and that the British could be defeated. American morale was greatly improved, and a general respect for American military ability was inspired.

The Bunker Hill Monument is located in the center of Breed's Hill. The cornerstone was laid June 17, 1825, by Gen. Lafayette in the presence of an enormous and enthusiastic crowd, among them many survivors of the battle fought 50 years before, who had gathered from far and near. After the singing of "Old Hundred," Daniel Webster delivered an address. The monument, 221 ft. in height, was completed June 17, 1843.

Bunsen (*bo͝on'sẹn*), ROBERT WILHELM, chemist, born at Göttingen, Germany, March 31, 1811; died at Heidelberg, Aug. 16, 1899. He studied at the Univ. of Göttingen and at Berlin, Paris, and Vienna. In 1836 he became professor at the Polytechnic Inst. at Kassel; in 1838, at the Univ. of Marburg; in 1851, at Breslau, and in 1852, at Heidelberg. He was the inventor of the Bunsen burner and of an electric cell, and discovered the principles for producing large quantities of magnesia and magnesium light. Bunsen also discovered spectrum analysis. He wrote extensively on physics, geology, and chemistry. His discovery of spectrum analysis opened a field so new and vast that it may be regarded as one of the most important scientific results of the last century; upon it depends the separation and measurement of gases. The Bunsen burner consists of a tube used in burning gas, which is mixed with air before ignition, thus producing a smokeless flame of great heat. He published "The Reaction of Flames" and "Chemical Analysis by Means of Spectral Observations."

Bunting (*bŭn'tĭng*), the name of several birds native to Asia and Europe. It resembles the finches, but differs from them mainly in having a bony knob on the palate, which is an enlargement of the dentary edges of the bill. The *snow bunting* is common to the colder regions, and the *common* or *corn* bunting is seen in England and continental Europe in the fields, where it gathers food. About 12 species have been described, and to these may be added a large number of birds very closely allied in habits and structure. They gather in flocks on the approach of winter and move toward the warmer regions, and in the spring go far north to breed. The *cowbird,* or *cow blackbird,* is a familiar bird of North America of this class. See *Cowbird.*

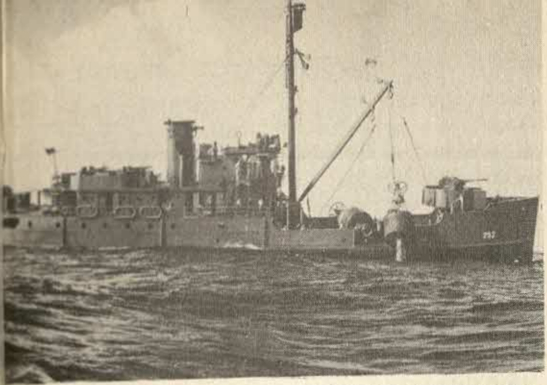
Bunyan (*bŭn'yan*), JOHN, religious writer and minister, born at Elstow, near Bedford, England, in 1628; died at London, Aug. 31, 1688. He was the son of a tinker and practiced that humble craft until about 17 years old, when he entered the army and was present at the siege of Leicester. He was self-educated; his library consisted of a Bible and a copy of Fox's "Martyrs." At the close of the Civil War he became interested in religious subjects and began to preach to the poor people in Bedford and the adjacent villages. He joined the Baptist congregation at Bedford and was chosen the pastor soon after, where he ministered for five years, attracting large congregations, and expressing nonconformist views. The act against conventicles checked his labors and he was convicted and sentenced to perpetual banishment. Acting in defiance of the law, he was imprisoned for 12 years. While in prison he supported his wife and children by making laces, and at the same time writing for the benefit of posterity. Release was offered him on the condition that he would quit the ministry, which he refused, and he was finally granted freedom by the act of James II declaring liberty of conscience. He again engaged as a preacher at Bedford and at the same time ministered to a congregation at Millane. His principal writings include: "The Holy War," "Grace Abounding to the Chief of Sinners," and "Pilgrim's Progress." The last mentioned is the most popular of his books, and has been translated into many languages. It is an allegory, giving a vivid account of Christian's trials on his way to the Celestial City.

Courtesy Brown Bros., N. Y.

JOHN BUNYAN

Bunyan, PAUL, a hero of American lumber camp stories. In the stories told about him, Paul Bunyan and Babe, his "Mighty Blue Ox," accomplished a variety of fabulous feats. Babe was reputed to be 93 hands high, and he and Paul could cover more than 20 towns at a stride. Among lumbermen, Bunyan, whose character may or may not have been based originally on a real person, achieved godlike proportions and the stories about him have the quality of "tall tales."

Buoys (*bōō'ĭz,* or *boiz*), floating bodies that are fastened or anchored at a point near the location of reefs, shoals, or other dangerous objects in or near harbors as a safeguard in guiding ships. They are usually painted in bright colors, as red and white, so they may be easily seen. A class known as *whistling buoys* have an apparatus which is acted upon by the movement of the waves, causing compressed air to escape through a whistle. In recent years electric incandescent lights were introduced. Buoys of this class are connected by wires with the shore, and are securely anchored by means of wire-rope moorings. Formerly large steamers could sail into harbor only in daytime, but with the use of electric buoys they pass safely at night The lights used are of 100-candle power, and are fastened to cedar buoys anchored with 5,000-pound weights. A new type buoy, called the lighted buoy, has also been developed which remains illuminated without cable connection. This buoy is equipped with either a battery or an acetylene tank and can remain



Official Coast Guard Photo

U. S. COAST GUARD BUOY TENDER HAULING IN BUOYS

illuminated from six months to a year. Electric life buoys are in extensive use. They are supplied with a storage battery that casts a light over a mile for six hours. It has proved of much value in the life-saving service.

Burbage (*bûr′bĭj*), RICHARD, actor, an associate of Shakespeare, born about 1567; died Mar. 13, 1619. He appears to have been a member of a company of actors who visited continental Europe, and seems to have exercised an influence upon the development of the theater in Denmark and Germany. With Shakespeare and Hemming, he took an interest in building the Globe Theater, and played some of the leading roles in "Richard III," "Hamlet," "Othello," and "King Lear."

Burbank (*bûr′bănk*), LUTHER, naturalist, born at Lancaster, Mass., Mar. 7, 1849. He spent his boyhood on a farm, where he devoted much time to the study of plant life. In 1875 he removed to Santa Rosa, Calif., where he established experimental farms for the purpose of originating new varieties of plants and improving many of the fruits and vegetables. He originated the Burbank potato; the Sugar, Stoneless, and Giant prunes; the Giant, Fragrance, and Shasta Daisy callas; the Burbank and Santa Rosa roses; and the America, October Purple, and Climax plums. Besides originating these and other new varieties, he improved many grasses, nuts, grains, flowers, and vegetables. He evolved a smooth and fruit-bearing cactus from the wild, thorn-covered variety. He improved the tobacco plant so it grows taller and yields larger leaves, and was especially successful in variegating the color, size, and durability of flowers. In carrying on this work he experimented extensively in cross fertilization. The forms originated and the plants materially improved by him are those selected from a vast number that have been studied and cross fertilized successfully. He died Apr. 11, 1926.

Burbot (*bûr′bŭt*), a fresh-water fish of the cod family, the only representative of that class of fishes which does not enter salt waters. In appearance it resembles the ling, having an elongated form and a broad head. The skin is covered with imbedded scales and the mouth is large. It has two small barbels on the nose and a larger one on the chin. It inhabits the streams and lakes of North America, from Canada to Mexico, and is sometimes called *eelpout, coney fish,* and *fresh-water cod.* Several species closely related are well known in the U.S., where they grow to a weight of 12 pounds, but the species of Europe are somewhat smaller.

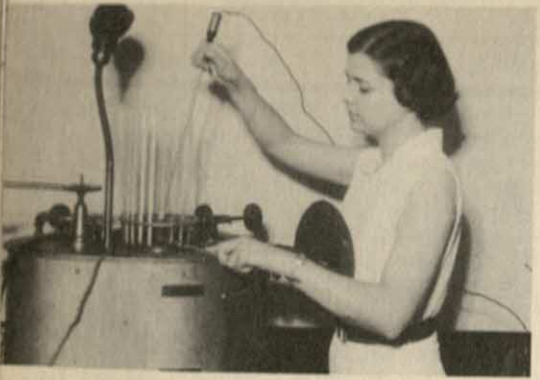
Burchfield (*bûrch′fēld*), CHARLES, American painter; born Apr. 9, 1893, in Ashtabula, O. He attended the Cleveland School of Art from 1912 to 1916, and had his first exhibition in 1916. Strongly lyric in feeling, Burchfield's painting often expresses a striking satirical attitude as well. He has had many notable shows since 1920.

Courtesy Brown Bros., N. Y.

LUTHER BURBANK

Burdekin (*bûr′dē-kĭn*), a river of Australia, in the northeastern part of Queensland. It rises in the Gilbert Range of the Australian Alps and flows S.E. until it is joined by the Belyando River, when it turns abruptly and flows almost due north into Upstart Bay, an inlet from the Pacific Ocean. It is about 350 m. long.

Burdett-Coutts (*bûr-dĕt′-ko͞ots′*), ANGELA GEORGIANA, BARONESS, British philanthropist, born Apr. 21, 1814; died Dec. 30, 1906. She inherited immense wealth from her grandfather, Thomas Coutts, and became deservedly popular for her great liberality and assistance rendered to churches, schools, and charities. She founded 50 scholarships, including the Burdett-Coutts scholarship at Oxford. The government granted her a peerage in 1871. The freedom of the city of London was conferred upon her in 1872, and the freedom of Edinburgh in 1874. In 1881 she married William Lehman Ashmead-Bartlett, born in New Brunswick, N.J., in 1851, who assumed her name. He was elected to Parliament in 1885



TESTING MERCURY-IN-GLASS THERMOMETERS

Mercury-in-glass thermometers are checked for accuracy by immersion in a water bath, the temperature of which is electrically controlled. The readings of the mercury thermometers are then checked against that of a platinum thermometer, the working standard of the Bureau's laboratories, that has been immersed in the same water bath

as a Conservative member for Westminster.

Burdette (*bûr′dĕt′*), ROBERT JONES, lecturer and humorist, born in Greensboro, Pa., July 30, 1844; died Nov. 19, 1914. He attended school in Peoria, Ill., and served in the Civil War. In 1869 he went to work for the Peoria *Transcript*, later for the *Review*, and still later became associate editor of the Burlington (Ia.) *Hawkeye*. His humorous sketches made him a national reputation. He entered the lecture field in 1877, and also became a Baptist preacher. Among his publications are: "Life of William Penn," "Innach Garden," "Chimes From a Jester's Bells," and the famous essay, "The Rise and Fall of the Mustache."

Burdock (*bûr′dŏk*), a coarse-looking weed with hooked flower heads that adhere to the wool of sheep, the hair of other animals, and to clothing. By these means the ripened seeds are widely distributed. It is a troublesome weed in Canada and the U.S., but in some countries is cultivated for food. The roots and young shoots are the edible parts. It yields medicine useful for rheumatism and cutaneous diseases.

Bureau (*bū′rō*), in government, a department of public business requiring a force of clerks, who work under the direction of a chief. In England and the U.S. the term is confined to inferior and subordinate departments, such as the pension bureau, but many governments apply the term to the higher departments, as the bureau of the minister of foreign affairs.

Bureau of Standards, NATIONAL. When it became known (around 1830) that weights and measures in daily use in U.S. custom houses differed widely from each other, Congress authorized the establishment of an Office of Standard Weights and Measures. With the increasing complexity of American industry the demand for reliable standards not only of weight, length, and capacity, but also of volume, power, and energy became general. On Mar. 3, 1901, Congress created the National Bureau of Standards which absorbed the Office of Standard Weights and Measures. Similar governmental agencies in existence in Germany since 1868, in Austria since 1871, in Russia since 1878, in England since 1879, served as models. The bill of March 3, 1901, specifies the functions of the bureau as follows: 1) custody of standards; 2) comparison of the standards used in scientific investigations, engineering, manufacturing, commercial and educational institutions with the standards adopted or recognized by the government; 3) the construction, when necessary, of standards, their multiples and subdivisions; 4) the testing and calibration of standard measuring apparatus; 5) the solution of problems which arise in connection with standards; 6) the determination of physical constants and the properties of materials when such data are of great importance and not to be obtained in sufficient accuracy elsewhere.

LISTENING TO THE SUN

This radiotelescope, one of a pair set up near Boulder, Colo., and operated by the bureau, is a giant ear which gathers electromagnetic messages from the sun in its daily path across the sky. The instruments are tuned to different frequencies, in order to receive signals at two different distances from the sun's surface

NATIONAL STANDARDS OF LENGTH AND MASS

Dr. L.J. Briggs, former director of the National Bureau of Standards, holds the national standard of length, Meter No. 27. Kilogram No. 20, the national standard of mass, is beneath the double bell jars on the second shelf of the vault in the background. These standards, supplied by the International Bureau of Weights and Measures, are made of an alloy of platinum and iridium

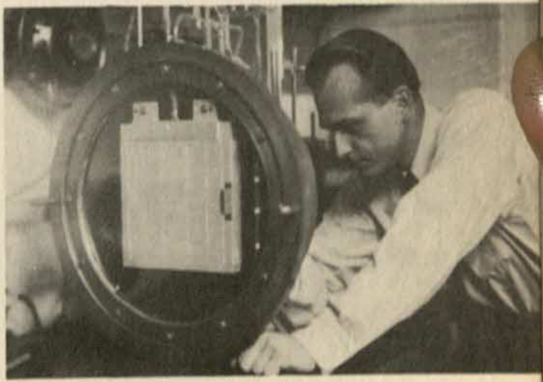
ATOMIC CLOCK

Based on a constant natural frequency associated with the vibrations of the atoms of the ammonia molecule, the clock promises to surpass by one or two orders of magnitude the accuracv of the present primary standard, the rotating earth. Former director of the National Bureau of Standards Dr. E. U. Condon (*left*) and Dr. Harold Lyons, inventor of the NBS atomic clock, stand before the control panel of the clock

PHOTOCHEMICAL STUDY OF SHEET MATERIALS

(*right center*)

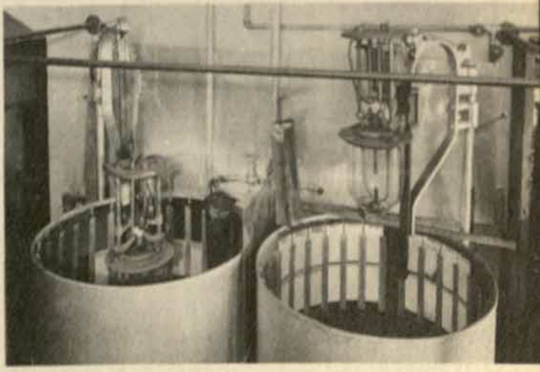
Cellulose, plastics, rubber, and other solid sheet materials are checked with this apparatus. After passing through filters which remove radiation of undesired wave lengths, light strikes the material which is held against a thermostated aluminum backing by means of air pressure. This backing removes the heat resulting from light action or light degradation, thus eliminating the heat effect which would ordinarily interfere in such light studies. The oxygen and moisture content of the air about the samples is also controlled



WEATHERING TEST FOR PAINTS

(*right bottom*)

Equipment used in testing paints includes a rotating drum, carbon-arc lamp, and water spray. The unit at the left is ready for operation, that at the right has its lamp raised



All photos in this series courtesy National Bureau of Standards

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Today the bureau's activities, conducted by its more than 70 departments, may be grouped under the following headings: weights and measures work, electrical work, gas engineering, safety engineering, study of radioactivity, X-ray measurements, atomic tests of measurements, atomic and molecular physics, heat and power measurement and research, investigation of building materials, study of automotive power plants, fuels, and lubricants, work in optics, work in chemistry, work in mechanics, sound measurements, study of structural and engineering materials, study of miscellaneous materials, work in metallurgy, work in ceramics, work in glass, standardization of equipment, building and housing service. The bureau also undertakes basic research projects of national importance: atomic energy, guided missiles, and the proximity fuze stemmed from, or were directed by, bureau research. Electronic and radio-propagation research have become increasingly important. Classes are provided for the instruction of the bureau's personnel.

The national and international importance of the Bureau of Standards is founded upon and enhanced by its cooperation with national agencies, and state and local governments and scientific, technical, and industrial organizations, also by participation in national and international conferences, and by collaboration with scientists and experts, as well as by personal studies undertaken by members of the staff. The main laboratories of the bureau are in Washington, D.C., and occupy 68 acres. For its impressive and comprehensive services the bureau charges "a reasonable fee," or cost price. Requests for tests that can be performed by private laboratories are discouraged by the bureau, which furnishes a list of such laboratories. Its "List of Publications of Interest to Household Purchasers" is mailed free. The bureau's pamphlet, "Government Publications of Use to Consumers," can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C.

Bureau of the American Republics, the original name of the Pan American Union, established Apr. 14, 1890, at the first International Conference of American States. See *Pan American Union.*

Burgess (*bûr′jĕs*), FRANK GELETT, author, illustrator, born in Boston, Mass., Jan. 30, 1866; died in Carmel, Calif., Sept. 18, 1951. He was graduated from the Mass. Inst. of Technology in 1887 and for three years worked as draftsman on the Southern Pacific Ry. In 1891 he became instructor of drawing at the Univ. of Calif., and subsequently joined the editorial staffs of several periodicals. The author of more than 30 volumes of satirical fiction, including "Vivette" (1897), "Are You A Bromide?" (1907), and "Too Good Looking" (1936), Burgess is best remembered for his jingle which began "I never saw a purple cow."

Burgess, T. J. W., physician and educator, born in Toronto, Canada, Mar. 11, 1849. He studied at the Upper Canada Coll. and Toronto Univ., and in 1870 became surgeon of the North American Boundary Commission, in which position he rendered efficient services and was thanked by the imperial government. In 1875 he became assistant physician of the London Asylum for the Insane. He was made professor of mental diseases at McGill Univ. in 1893, and was chosen president of the American Medico-Psychological Association in 1904. His publications are numerous and include works on botanical, historical, and psychological subjects. He died in 1926.

Burglary (*bûr′glȧ-rȳ*), the crime of breaking and entering the dwelling of others with felonious intent. The statutes of most states of the U.S. define burglary as breaking and entering by night only, though others include housebreaking by day. Gaining admission by trick or threat or by lifting a latch is called constructive burglary, as distinguished from actual burglary when the breaking is committed by forcibly opening a door or a window.

Burgos (*bōōr′gôs*), a city of Spain, capital of a province of the same name, 130 m. N. of Madrid. It is on the Arlanzón River, near the Sierra de Oca, and has railroad and electric railway facilities. The surrounding country produces cereals and fruit. Burgos is important as a market for wool, merchandise, and machinery. Hat making and weaving are among the chief industries. It has a Gothic cathedral founded in 1221, the most elaborate example of Gothic architecture in Spain, which contains the tombs of El Cid Campeador and Don Fernando, who resided at Burgos. Founded in the 9th century, Burgos was the capital of the kingdom of Castile until 1087, when Alfonso VI removed the seat of government to Toledo. During the 15th century Burgos was used alternately with Toledo as a royal residence. After the court was finally transferred to Madrid in 1560, Burgos declined rapidly in importance. In 1808 the Spanish army was defeated at Burgos by the French and in 1813 the city was captured by Wellington. Gen. Franco made it his headquarters during the Spanish civil war, 1936-39. Population, 1947, 78,929.

Burgoyne (*bûr-goin′*), JOHN, one of the chief commanders of the British in the American Revolution, born in 1722; died in London, Aug. 4, 1792. He entered the army in 1758 as a subordinate, serving first at Belle Isle, and later took part in the war against Portugal and Spain. He became a member of Parliament in 1761. In 1776 he came to America and took a prominent part in the Revolutionary War. He served as a commander in the Battle of Bunker Hill. In 1777 he took charge of a large force to penetrate from Canada into the districts south, then in a state of revolution. He captured Ticonderoga, but was surrounded by the Americans under Gen. Gates at Saratoga and was compelled to surrender. He thereupon returned to England, where he was denied an audience by the king. When a change of administration occurred, he was appointed commander in Ireland, but he resigned the position after two years and engaged

SURRENDER OF GENERAL BURGOYNE AT SARATOGA, N. Y.

From a painting by John Trumbull (1756-1843)

in literature. He wrote an account of his campaigns in America, as a matter of defense, and published "The Maid of the Oaks" and "The Heiress." The latter is still a popular play.

Burgundy (*bûr′gŭn-dĭ*), once an independent kingdom of Europe, but now included chiefly in the French departments of Yonne, Côte-d'Or, Ain, and Saône-et-Loire. The ancient Burgundians were a Germanic tribe that settled on the banks of the Vistula and Oder, and afterward spread to the Rhine and Neckar. In the year 407 A.D. they penetrated into Roman Gaul. Their kingdom was divided about 451, after a defeat of their King Gundicar by Attila the Scourge. In 534 they were conquered by the Franks, but a portion of their country became independent in 832. They again became powerful in 930, but in 1038 were annexed to the German Empire. Subsequently a number of changes in the ruling dynasties occurred which passed the title of their domain to various rulers. A portion of the region passed to Austria by the marriage of Mary of Burgundy to Maximilian, and a large part was acquired by Louis XI as a male fief of France.

The first dynasty of Burgundy included 12 personages, who succeeded each other and ranked among the most powerful princes of their time; most of them were friendly with the kings of France. After the extinction of their line, the ruling influence passed to Philip the Bold, son of the French King John, and from him to his three successors: John the Fearless, Philip the Good, and Charles the Bold. These three sovereigns ranked among the most famous characters in the history of their time. During the reign of the last two mentioned, Burgundy included The Netherlands and several other countries.

The region included within Burgundy is fertile and productive. It is now penetrated by many railroads and contains the cities of Chalon-sur-Saône, Dijon, and Mâcon. The department of Côte-d'Or is noted for its large output of Burgundy wines, which are celebrated for their rich flavor and delicate qualities.

Burial (*bĕr′ĭ-ạl*), the disposal of the bodies of the dead. It is one of the oldest customs practiced by men. The first evidence of intentional burials comes from Paleolithic times when Neanderthal men buried their dead in cave floors, and supplied them with tools of stone probably to serve them in the next life.

The disposition of the dead and funeral rites differ greatly from place to place. They are influenced primarily by religious practices and beliefs in the life hereafter, but also by environmental and climatic conditions. In hot climates, where the body is subjected to rapid disintegration, it is usually disposed of immediately after death.

The four principal methods of burial practiced by mankind are mummification, interment, exposure, and incineration. Very often different methods are used by peoples living side by side. The tribes of central Australia practice interment, while those of the south and north expose their dead in the limbs of trees. Other Australian tribes (*e.g.*, in Queensland) practice mummification. Many peoples expose the bodies of their dead to be devoured by animals and birds, a custom still in vogue among the Bushmen of South Africa.

Because of its close connection with life after death, the matter of burial has always been of great interest and concern to all mankind and often developed into elaborate ceremonies. From the ancient Greeks and Romans, who maintained elaborate burial rites, comes the practice of threefold sprinkling with earth, a custom which is now used extensively when the casket is lowered in the grave or set in the tomb. In India many bodies are thrown into the Ganges River, which the Hindus consider sacred as a stream flowing toward immortality.

Mummification was the chief method used in Egypt, a custom which originated with the belief in the continuation of life after death. Here the bodies were embalmed and kept in expensive tombs. The Greeks and Romans, like the Egyptians, to some extent embalmed their dead, but inhumation was a more general method; later cremation came to be practiced. In some countries, especially in Assyria and Babylonia, the dead were generally buried by placing the body on the surface of the ground and covering it with a mound, which then was surrounded with stone and covered with decorations.

Interment in ancient times was more largely in tombs, and these were built on the property belonging to the family, but later burial grounds were set apart for the interment of persons belonging to a certain society or church, and subsequently community or municipal cemeteries were established. The popular plan at present is to inter the bodies in the ground to a depth of from 4 to 7 ft., but in many places tombs are erected to receive the bodies, placed in caskets made of wood or metal. Tombs are usually large enough for a number of persons or even a number of families, and where the ground is low and wet, as in New Orleans, this method of disposal is very popular. Many cemeteries are established and maintained by churches, but the tendency now is toward private ownership and control. Cremation, practiced very extensively among Greeks and Romans, went out of use with the rise of Christianity, but it has now been gaining again in favor mostly on the ground that it is a more sanitary method.

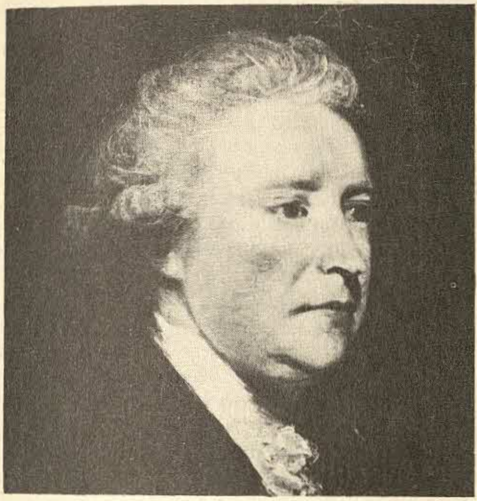
Buriates (*bōō'rĭ-āts*), a nomadic race of people native to Southern Siberia. They are Tartars, a branch of the Kalmucks, and have been subject to Russia since 1664. They inhabit the region about Lake Baikal and support themselves by farming and stock-raising, but more recently they have taken up mechanic arts and some branches of trade. A number have been converted to the Greek Church, though the larger portion retain a preference for their worship of idols. Their dwellings consist largely of huts, or *yurts*, and these are protected from the colds of winter by coverings of leather and felt. These people number about 250,000.

FUNERAL PROCESSION

Scene from a pre-Christian Egyptian relief

Burke (*bûrk*), EDMUND, philosopher and statesman, born in Dublin, Ireland, Jan. 1, 1729; died July 9, 1797. He entered the Univ. of Dublin in 1744, graduated after four years of study, and secured a master's degree in 1751. Later he studied in London and became devoted to literary work. His first production was published in 1756, entitled "Philosophical Inquiry Into the Origin of Our Ideas on the Sublime and Beautiful," which attracted much attention and secured him the friendship of many noted men, among them Dr. Samuel Johnson. He became a member of Parliament in 1765, where he secured distinction from the first on account of his excellent speeches and wide knowledge of human government and literature. The Rockingham ministry became dissolved in 1766, and he held no office in the ministry of Lord North. He published two pamphlets, 1769-70, entitled "Thoughts on the Cause of the Present Discontent" and "The Present State of the Nation." He delivered a number of speeches that thrilled all England, in which he advocated a liberal policy of justice and conciliation toward the colonies, including "On Conciliation with America."

Burke showed wonderful eloquence and mastery of detail in a number of speeches delivered in connection with the impeachment of Hastings, in which he was the prime mover. A strong opponent to the French Revolution, he published his famous pamphlet, "Reflections on the Revolution in France," in 1790, which was widely read. He withdrew from Parliament in 1794. He was regarded as one of the best orators of England, but his speeches were usually lengthy and failed to hold the attention. His writings are exquisite examples of beautiful rhetoric.



EDMUND BURKE

Burke, RAYMOND, U.S. Senator, born Nov. 28, 1880, in Running Water, S.D. He attended Beloit Coll., Wis., received his LL.B. at Harvard Law School in 1911 and in the same year was admitted to the Nebraska bar. Between 1926-32, he served in succession as president of Omaha's Bar Assn., president of Omaha's school board, and member of the General Council of the American Bar Assn. His political career began as floor leader at the Democratic National Convention in Chicago in 1932, and the next year he went to Washington as a member of the 73rd Congress from the second Nebraska district. He was elected Senator from Nebraska in 1934. During his period in office he fought President Roosevelt's plan to enlarge the Supreme Court, opposed the Wagner Labor Relations Act and a Presidential third term, but sponsored the Selective Service Act of 1940. He was defeated in the Nebraska Democratic primaries of 1940.

Burlap (*bûr′lăp*), a coarse plain-woven fabric used for sacks, bags, and wrappings, sometimes called *gunny sacking*. Better grades are used for furniture covers and other upholstery purposes. Burlap is made from jute, hemp, or cotton fibers. About 60 per cent of the burlap exports of India are purchased by the U.S., whose average consumption of this fabric is 80,000,000 yards per month.

Burleson (*bûrl′sŭn*), ALBERT SIDNEY, politician, born at San Marcos, Texas, June 7, 1863; died Nov. 24, 1937. He practiced law at Austin, where he was city attorney and district judge, and in 1899 was elected to Congress, serving continuously until 1913, when he entered President Wilson's cabinet as Postmaster-General, from which office he retired in 1921.

Burlesque (*bûr-lĕsk′*), a dramatic or literary composition tending to excite contempt or laughter by extravagant images, or by a contrast between the subject and the manner of treating it. In this form of composition, insignificant things are described in glowing terms, while elevated and important subjects of thought are treated in the most commonplace language. The writings of William Schwenck Gilbert (*q.v.*) contain good examples of burlesque in which fads and affectations play an important part, and the highest dramatic excellence is attained in the works of Molière. Chaucer's "Rime of Sir Thopas" is a burlesque on the tales of the Middle Ages, and Cervantes' "Don Quixote" is a popular work intended to ridicule the romantic tales of chivalry. *Vaudeville* is of French origin and originally corresponded to burlesqe, but later came to signify a variety show.

Burlingame (*bûr′lĭng-găm*), ANSON, statesman, born in New Berlin, N.Y., Nov. 14, 1820; died at St. Petersburg, Russia, Feb. 23, 1870. He attended the Univ. of Michigan and the Harvard Law School, and practiced law in Boston. In 1852 he was elected to the State Senate of Massachusetts. He was elected to Congress in 1854, where he became noted as an able speaker and an ardent opponent of slavery. President Lincoln appointed him minister to Austria, but that government declined to receive him in that capacity because he had spoken in favor of Hungarian independence. However, he was made minister to China in 1861, and, when his term expired, he was appointed special envoy to the U.S. and the principal powers of Europe by Prince Kung to make treaties with different nations, a distinction never before conferred upon a foreigner. The Burlingame Treaty between the U.S. and China (1868), based on the principles of international law, conveyed to both nations certain privileges, among them the right to found schools and the freedom of religion. Burlingame visited Denmark, Sweden, England, Germany, Holland, and other European countries, and in 1870 reached St. Petersburg, Russia, to negotiate a Chinese treaty, where he died.

Burlington (*bûr′lĭng-tŭn*), county seat of Des Moines County, Iowa, on the Mississippi River, 135 m. S.E. of Des Moines, on the Chicago Burlington & Quincy and Rock Island R.R.'s. River boats connect it with ports on the Ohio, the Mississippi, and the Gulf. The chief buildings include the courthouse, the city hall, the Federal building, the Memorial Auditorium, the public library, and the central high school. Near the city are rich limestone deposits. The manufactures include furniture, pearl buttons, caskets, machinery, implements, soap, sand and limestone quarries, leather goods, electric motors, boilers, burlap bags, clothing, building products, food and dairy products. It has many parks and gardens, and is noted for its imposing site on high bluffs above the river. It is the site of Burlington Junior Coll. It was first settled in 1833 and was chartered as a city in 1838. It was the temporary capital of Wisconsin Territory, 1837, and of Iowa Territory in 1838. Population, 1930, 26,755; in 1940, 25,832; in 1950, 30,613.

Burlington, a city in Burlington County, New Jersey, on the Delaware River, 18 m. N.E. of Philadelphia. It is on the Pennsylvania R.R. It is surrounded by a fertile agricultural and fruit country. Manufactures include machinery, iron pipe, food, textiles, paper, cement, and shoes. The chief buildings include St. Mary's Hall, St. Mary's Church (Episcopal), and a public library chartered by George II in 1757. It is the birthplace of James Fenimore Cooper. Quakers settled it in 1677, and it was incorporated in 1693. Population, 1940, 10,905; in 1950, 12,051.

Burlington, county seat of Chittenden County, Vermont, and largest city in the state, on Lake Champlain, on the Central Vermont and the Rutland R.R.'s. It is the principal port on Lake Champlain and a center of industry. The chief industries include machine tools and engines, marble textiles, wood products, lumber, and maple products. It is the seat of the Univ. of Vermont and State Agricultural Coll., Trinity Coll., and Mt. St. Mary's Acad. for girls. Ethan and Ira Allen, of Revolutionary War fame, were large landowners here. It was chartered in 1763. Population, 1900, 18,640; in 1950, 33,155.

Burma (*bûr′mȧ*), UNION OF, an independent federal republic of southeastern Asia. The boundary on the N. is formed by Tibet; on the E. by China, French Indo-China, and Siam; S. by the Bay of Bengal and the Gulf of Martaban; and W. by the Bay of Bengal, Pakistan, and India. From north to south it has a length of 1,250 m., its breadth in the southern part is only 30 m., while in the central part it broadens to a width of 550 m. The area is 261,789 sq. m. (Burma proper, 162,290 sq. m.; Shan State, 61,090 sq. m.; Kachin State, 4,506 sq. m.; Karenni State, 33,903 sq. m.).

DESCRIPTION. Burma is split up into natural divisions by its rivers and mountain ranges. The valleys of the Irrawaddy, Chindwin, and Sittang form a narrow strip of plain land, running down the center of the main mass and widening out into the delta country on either side of Rangoon. The sea forms the southern limit of this strip. On all other sides the central level plain is enclosed by hill ridges—in the north by the Kachin, in the west by the Chin, and in the east by the Shan and Karen Hills.

Burma lies chiefly in the basin of the Irrawaddy River, which rises in the Himalayas and flows south into the Bay of Bengal by an extensive delta. Near Mandalay it is joined by the Chindwin, its largest tributary. The delta is very extensive, covering an area of 18,000 sq. m., and during the rainy season this section overflows. In the eastern part the drainage is chiefly by the Salween and its tributaries. The Salween flows south and discharges into the Gulf of Martaban near Moulmein.

The climate is varied, ranging from the torrid in the southern part to the temperate in the higher altitudes of the north. In most sections the climate is tropical, and the rainfall is very heavy, although the precipitation in the central plain is very low (25 to 45 in.). The coast ranges have a precipitation ranging from 120 to 200 in., and in some northern regions the rainfall is irregular, ranging from 30 to 150 in. The temperature in the lowlands has a mean average of about 85°, and in the

BURMESE VILLAGE

Indian Official Photo

interior the summers vary from 80° to 95°, while the winters are about 30° lower. Europeans find the lowlands unhealthful and the monsoons unpleasant. These winds blow from the sea in the summer, causing heavy precipitation, while in the winter they move from the north toward the sea, thus causing a dry season in winter and excessive moisture in summer.

FLORA AND FAUNA. Burma is rich in dense tropical forests, which include the valuable teak, ironwood, palm, betel, and bamboo. The coconut, palmyra, mango, and other trees abound. Crotons, screw pines, balsams, oranges, pineapples, begonias, and many others are cultivated. Wild animals are abundant, both in the jungles and the mountains. They include the crocodile, tapir, goat, gibbon, buffalo, elephant, and many varieties of birds and monkeys.

MINERALS. Though rich in mineral wealth, Burma has not fully developed its mining. Rubies, amber, and sapphires are mined, and gold is obtained in the sand of many streams. Teakwood, tin, silver, petroleum, lead, zinc, and copper are important natural resources, as is wolframite (of which Burma produces 10% of the world's supply). Considerable interest has been developed in quarrying white marble. This product is obtained largely near Mandalay and is favored by the Buddhists in making sculptures and for decorating temples. Burma maintains considerable trade in jade with China.

INDUSTRIES. Farming is the chief industry. The land is owned by the state and is leased to the farmer, who is required to pay a tax based on the extent and fertility of the land worked. Rice is the chief product, and 70% of the total cultivation is devoted to it, with Burma taking first rank in the export of this cereal before World War II. Other products embrace cotton, sugar cane, millet, oil seed products, and vegetables.

The elephant is used extensively as a beast of draft and burden, but more recently the horse and mule have come to occupy an important place in farming. Cattle are grown extensively for dairying purposes.

The weaving of silk and cotton is a growing enterprise and is practiced in all of the cities. Earthenware of various kinds, jewelry, clothing, agricultural implements, and furniture are among the leading manufactures. Transportation is facilitated by the Irrawaddy, the Salween, and a number of other rivers, some of which have been improved by embankments and connected with centers of trade by canals. A railroad line extends from Rangoon to Mandalay and other points of the interior and the northern section. Many highways have been improved, and the chief cities have been fortified in modern style. The exports exceed the imports, and foreign trade is largely with China, the British Commonwealth, and the U.S. Rice, cotton, hides, rubber, and lumber are exported. The manufacture of matches has become increasingly important in recent years. The chief imports include textiles, raw silk, fish, and metal products.

BURMESE PAGODA

Women buying flowers to offer at the pagoda

INHABITANTS. The inhabitants consist chiefly of Burmese, who are related to the Chinese. They constitute an important branch of the Mongolian race, and probably descended from people who came from Tibet. They are medium and heavy-set in stature, and have black hair, brown skin, broad skulls, and black eyes. The language is monosyllabic, much like the Chinese, and the characters in writing are more or less circular. The civilization is stationary and stereotyped, maintaining its characteristic features from century to century. A large amount of wealth is lavished on temples. The religion is Buddhism, and the *ca.* 20,000 Buddhist monks have a marked influence socially and politically. Rangoon, the capital, on the Rangoon River, and Mandalay, on the Irrawaddy, are the chief commercial centers. Other cities of importance are Akyab, Bassein, Moulmein, and Myitkyina. The total population, including that of the dependent states, is nearly 17,000,000.

GOVERNMENT. In 1937 Burma ceased to be a part of India and became a partially self-governing unit of the British Commonwealth. Representative government with a bicameral legislature had been inaugurated in 1935 with the Government of Burma Act. A coalition executive council was formed in 1946, with the head of the council being known as the prime minister. A constituent assembly met in June 1947 and voted that the future status of the country would be as "an inde-

Courtesy British Information Service, N. Y.

ANGLO-BURMESE TREATY CEREMONY

The treaty, signed in 1947, assured Burma's status as an independent republic

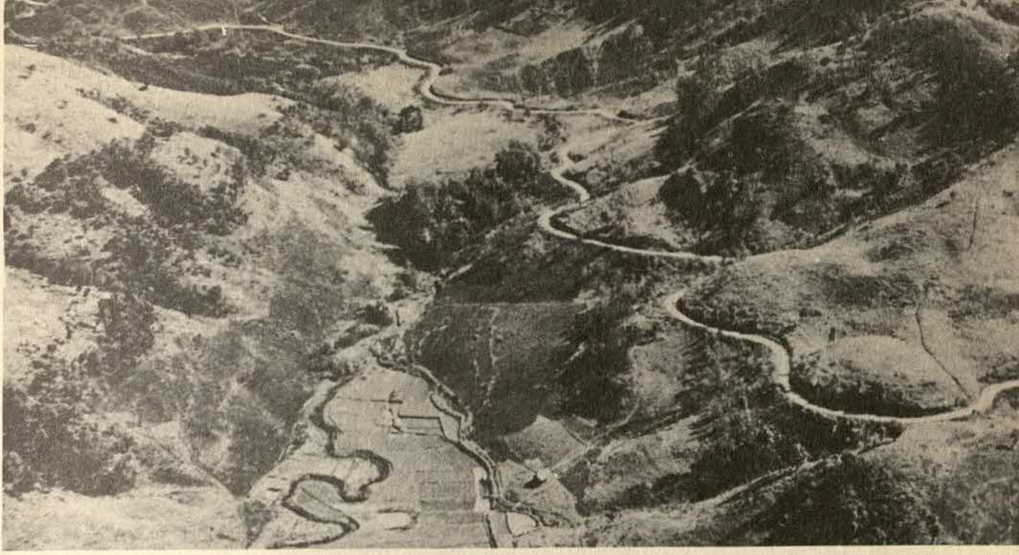
pendent sovereign republic to be known as the Union of Burma." In October 1947 Burma received full sovereignty, effective in 1948; unlike India, Burma announced her withdrawal from the British Commonwealth. The constitution adopted Sept. 24, 1947, provides for a president, a Union Parliament comprising the Chamber of Deputies and the Chamber of Nationalities, and a cabinet headed by a prime minister. Each state has a certain measure of administrative autonomy and is represented in the cabinet by a minister.

History. The ancient and modern history of Burma is not important as it affects the history and civilization of the East. It is thought that Burmans came to the valley of the Irrawaddy River more than 2,000 years ago. The region was long divided into two kingdoms, those of Pegu and Ava, which contended against each other for mastery many years. The former seems to have attained its zenith about 1580, when the Peguans became dominant over all Burma, and they held sway until 1752, when a temporary decline began through European influence in the delta of the Irrawaddy. About that time the kingdom of Ava began to rise and overthrew the domain of Pegu. In 1755 the city of Rangoon was founded by Alompra, an energetic Ava chief, who made it the commercial center of Burma, which attained its greatest power as an independent nation in 1822.

The British East India Co. gained a strong foothold in the latter part of the 18th century, when it founded factories and opened up an important trade. In 1824 the British invaded Burma. This resulted in Assam being relinquished by the Burmese, and a second war in 1852 resulted in the annexation of Pegu as British territory. The British again invaded Burma in 1885 because of disputes regarding commercial concessions, and the following year the remainder of Burma was proclaimed a part of Great Britain. In 1896 a Franco-British treaty was concluded by which the Mekong was made the boundary between Burma and French Indo-China. Britain ruled Burma as an integral part of India until 1937, when the Burmese won internal self-government under a British-appointed governor. In 1942 Japan invaded and conquered Burma, setting up a puppet regime and closing the Burma Road, over which the Western Allies of World War II had been supplying China. British forces from India and

Photo by Paul Popper, London

BURMA. ELEPHANTS CARRYING TEAKWOOD



BURMA ROAD

Used as an emergency war supply route during the Japanese occupation of the Chinese coast, the 700-m. road was built in 1937-38 and extended from Lashio, Burma, to Kunming, China. It was closed after the Japanese capture of Burma in World War II and replaced by the Ledo Road and the air ferry over the Himalayas

Gen. Joseph Stilwell's Chinese-American troops harassed the Japanese and reinvaded Burma in December 1944, capturing Rangoon in May 1945.

Rejecting Britain's postwar offers of dominion status, Burma won complete independence in January 1948 and was admitted to the U.N. later in the year. The new state immediately became embroiled in a civil war. The Anti-Fascist People's Freedom League (AFPFL), a socialistically inclined coalition which had led the struggle for independence, formed the new government, but met armed opposition from Communists and other left-wing factions and from a strong separatist movement among the Karen people. At times Premier U Nu's government was seriously threatened, but by 1953 order had been generally restored. The first general election took place in 1952, returning U Nu and the AFPFL to office. Economic conditions, including rice production, also improved gradually.

Although Burma joined the British Commonwealth's Colombo Plan for Asian development, it did not become a member of the Southeast Asia Treaty Organization (SEATO) and attempted to steer a neutral course, maintaining friendly relations with both Communist and non-Communist nations. After cutting off U.S. aid in 1953, Burma, beginning in 1956, received U.S. loans for economic development. At the same time, however, it made barter agreements with the U.S.S.R. and other Communist countries.

Burnand (*bûr'nand*), SIR FRANCIS COWLEY, lawyer and author, born in London, England, Nov. 29, 1836; died in Ramsgate, April 21, 1917. He studied at Eton and at Trinity Coll., Cambridge, and first took up theology but later studied law and was admitted to the bar in 1862. After having contributed to periodicals, he became editor of *Punch* (1880). His "Happy Thoughts" went through more than 20 editions. His burlesque entitled "Black-Eyed Susan" was dramatized and ran 800 nights.

Burne-Jones (*bûrn'jōnz'*), SIR EDWARD COLEY, artist, born in Birmingham, England, Aug. 28, 1833; died in London, June 17, 1898. He was graduated from Exeter Coll., Oxford, where he was a friend of William Morris (*q.v.*). He is grouped with the Pre-Raphaelites. Elected to the Royal Acad. of Arts in 1885, he was made a baronet in 1894. His "Legends of Briar Rose" (a series of four paintings illustrating the "Sleeping Beauty" fairy tale) were well known, as were his designs for stained-glass windows.

Burney (*bûr'nê*), FANNY or FRANCES. See *Arblay, Madame D'*.

Burnett (*bûr-nĕt'*), FRANCES ELIZA HODGSON, writer, born in Manchester, England, Nov. 24, 1849; died on Long Island, N.Y., Oct. 29, 1924. She came to America in 1865 and began writing at an early age, one of her early stories being published in *Scribner's Monthly* in 1872. Her books, among which were many stories for children, were widely read, and a number were dramatized. Her writings include "Little Lord Fauntleroy" (1886), "Haworth's" (1879), "Louisiana" (1880), "Sara Crewe" (1888), "The Secret Garden" (1911), and an autobiography, "The One I Knew Best of All" (1893).

Burnham (*bûrn'am*), SHERBOURNE WESLEY, astronomer, born at Thetford, Vt., Dec. 12, 1838; died in Chicago, Ill., March 11, 1921. He studied astronomy while working as a shorthand reporter in Chicago and discovered a number of double stars. In 1876 he became connected with the Chicago Observatory and, in 1888, with the Lick Observatory. He was made professor of practical astronomy in the Univ. of Chicago. In 1874 he was made a fellow in the Royal Astronomical Society of England. He catalogued 1,274 new double stars, more than were observed by any other one astronomer, and published a general catalogue of these stars.

Burning Glass (*bûrn'ing glȧs*), an instrument to concentrate the rays of the sun. It consists of a double convex lens, hence is thick in the center and thin at the edges, and brings the rays of solar heat to a focus at nearly the same point to which it brings the rays of light. This instrument is used to set fire to various substances, such as paper and wood. Burning glasses were made by the ancients, and Aristophanes and several writers declare that Archimedes fired the Roman ships by means of burning mirrors. George Buffon (*q.v.*), the French naturalist and philosopher, made a large reflector with which he set fire to wood at a distance of 210 ft., proving the possibility of Archimedes having thus burned the Roman fleet.

Burnley (*bûrn'lē*), a city of England, in Lancashire, 24 m. N. of Manchester. It is located on the Burn River and the Leeds and Liverpool Canal, and has transportation facilities by numerous railway and electric railroad lines. The chief manufactures include textiles, clothing, machinery, and ironware. Slate quarries and iron mines are worked in the vicinities. It was incorporated as a town in 1861. Population, over 100,000.

Burns (*bûrnz*), ROBERT, Scotland's great lyric poet, born near Ayr, Jan. 25, 1759; died July 21, 1796. He was a son of poor peasants, who manifested remarkable eagerness for his intellectual improvement. He was fond of reading and interested in writing poetry from early youth. Every effort was made to give him and his brothers and sisters a good education, but owing to a want of means his instruction was necessarily restricted. His library consisted of a small collection of poems and the Bible. He assisted in the labors of the farm in connection with his brother Gilbert, and devoted his spare moments to writing poetry and short sketches. In the meantime he learned French, the elements of Latin, and the popular songs of Scotland. In 1785 he formed a liaison marriage with Jean Armour, a person somewhat above his own position in life, and three years later he was legally married to her. His literary work was more successful than his farming, which proved an unprofitable enterprise, and he resolved to leave his native land and emigrate to Jamaica. For the purpose of securing means to pay his passage, he published a number of his poems at Kilmarnock in 1786. These were received with such favor that he changed his plans. Accepting an invitation to Edinburgh that same year he became acquainted with other writers. He even published another edition of his poems under the title of "Poems Chiefly in the Scottish Dialect," 1787, which brought him not only fame but a net gain of £500. Despite the recognition he had gained and his improved financial status, Burns left the city after one year, however. In 1788 he was given the position of an exciseman with a government salary of $350, which he held in connection with the work of the farm which he had rented near Dumfries. Here he continued his diligent labors with his pen, producing some of the most beautiful songs adapted to Scottish tunes, and many of his popular and immortal poems. It was unfortunate for him that he was located in so small a village as Dumfries, surrounded by a class of idle people, as this circumstance was at least one of the reasons why he was led to dissipate. His constitution was broken by irregularities, passions, and care. He began prematurely to decline, and became afflicted with rheumatic fever at the early age of 37. His intimate friends and admirers supported his wife and four children by subscription, and four volumes of his poems were published in 1800 by Dr. Currie, of Liverpool, for the purpose of furnishing additional support to them.

Courtesy British Information Services, N. Y.

ROBERT BURNS

Burns ranks among the best Scottish writers. His works are characterized by a vigorous imagination and a vein of purity and honesty so deeply manifested in his heart. Not only were his poems very often in his native dialect, but their spirit and mood were always dictated by a deep love of his home country and a sensitivity to nature. His poetry frequently has the characteristics of the folk song and his honest natural approach to his art was of great influence on the literature which followed him. His influence can be seen in the works of Sir Walter Scott, Thomas Moore, Byron, and Shelley. Although Burns is best known as a lyric poet, his prose writings—letters and little political essays—are also noteworthy. Among his most noted works are: "The Cotter's Saturday Night," "Auld Lang Syne," "On Turning a Mouse's Nest with the Plough," "Scots Wha Hae Wi' Wallace Bled," "Tam O'Shanter," "The Jolly Beggars," "Highland Mary," and "Ye Banks and Braes." Thus he expressed his fondest wish:

> "That I for poor auld Scotland's sake
> Some useful plan or book could make,
> Or sing a sang at least."

Burns and Scalds (*bûrnz and sca̤ldz*), in medicine, the name for injuries to the body caused either by excessive dry heat (140° F. and more, burns), by moist heat (over 120° F., scalds), or by chemical agents. Six different degrees are distinguished, dependent on the depth of the injury, from reddened skin to total destruction of all parts of the tissue including the bone.

Burnside (*bûrn'sīd*), AMBROSE EVERETT, soldier and statesman, born at Liberty, Ind., May 23, 1824; died in Bristol, R.I., Sept. 3, 1881. His first occupation was that of a tailor. Later he studied at West Point, from which he was graduated in 1847, and served with distinction in the Mexican War. At the close of the war he invented a breech-loading rifle and began manufacturing it at Bristol in 1853. He enlisted at the beginning of the Civil War, commanding a brigade at Bull Run. In 1862 he captured the Confederates' garrison at Roanoke Island with 2,500 men, and later forced Forts Macon and Beaufort to surrender. He was transferred to the Army of the Potomac in 1862, was promoted to a major general, and engaged the Confederates in a battle at South Mountain, Sept. 14, 1862. In the same year he took an active part in the Battle of Antietam, after which he succeeded Gen. McClellan in command, and was superseded by Maj.-Gen. Hooker and transferred to the department of the Ohio. After 1863 he devoted himself to recruiting, and resumed command of an army of 20,000 men in 1864 under Gen. Grant. He took part in the battles of the Wilderness, Cold Harbor, and Petersburg, and resigned from the army on Apr. 15, 1865. In 1866 he was elected governor of Rhode Island, became interested in railroad construction, and went to Europe to act as envoy in the peace negotiations between Germany and France. He returned to America and was elected to the U.S. Senate from Rhode Island in 1875, and was re-elected in 1880. His public service was distinguished by devotion to public interest.

Burnt Offering (*bûrnt ôf'ẽr-ĭng*), the object offered as an atonement for sins and burnt on the altar as a sacrifice. The practice of burning objects of value was in vogue both among pagans and the Jews, the former offering their sacrifices to idols and the Jews to Jehovah. Both animals and vegetable products were burned. When the whole offering was consumed upon the altar, it was known as the whole burnt offering. The peace offerings consisted usually of parts of animals, of which portions were given to the priests for their families. See *Sacrifice*.

Burr (*bûr*), AARON, statesman, born at Newark, N.J., Feb. 6, 1756; died on Staten Island, N.Y., Sept. 14, 1836. He was the grandson of Jonathan Edwards, the son of a noted clergyman, and was left an orphan at an early age. After graduating from Princeton Coll., he joined the Revolutionary Army as a private near Boston. He accompanied Benedict Arnold to Quebec, was promoted to the rank of major, and attained a high reputation. Washington invited him to his headquarters in New York, but he preferred to become aide to Gen. Putnam, which caused a break in Washington's friendship. Burr was made lieutenant colonel in 1777, distinguished himself at Monmouth in 1778, became a commander at West Point, and resigned in 1779 on account of impaired health. He studied law at Albany, and was admitted to the bar in 1782. He married Mrs. Augustine Prevost, a lady with British sympathies, and settled at Richmond Hill. In 1784 he became a member of the General Assembly in New York

Courtesy Brown Bros., N. Y.

AARON BURR

and five years later was made attorney general, which position he held two years. In 1791 he was elected to the U.S. Senate, serving six years, acting with the Republican-Democrat party, the name then given to the Anti-Federalists.

He was a candidate for President in 1800. Though the party received the largest support in the election, there was no choice, and he was elected Vice-President, with Thomas Jefferson as President. Four years later he was a candidate for governor of New York, but failed to secure the support of the leading men of his party and was defeated. His defeat was the direct cause of a duel with Hamilton, in which the latter was killed. Burr fled to the home of his daughter, Theodosia, in South Carolina, but was apprehended and tried for murder and acquitted. All his political prospects being dissipated, he turned his attention to founding an empire in the Southwest. In 1805 he met Harman Blennerhasset and interested him in his schemes, surrounded himself with adventurers from East and West, and traveled through Kentucky and Tennessee to solicit recruits. His plans were discovered by Gen. James Wilkinson, a veteran of the Revolution, who reported them to the President. President Jefferson promptly issued a proclamation warning his followers to withdraw from the project. He was twice arrested, but finally acquitted.

In 1808 he sailed to Europe with the intention of soliciting support to found an empire in Mexico, but was expelled from England, and then made fruitless efforts in the interest of his scheme in Sweden, Germany, and France. In this enterprise he failed and came to Boston in May, 1812, under the name of Arnot, in a penniless condition. Later he settled in New York and practiced law with good prospects, but in 1813 his daughter, Theodosia, one of the most accomplished women of America, was lost at sea while traveling from Charleston to New York to visit her father. This sad incident broke his spirits, but later, at the age of 78 years, he married Mme. Jumel, the widow of a French merchant. He was a man of fascinating address and polished manner, to which his success was largely due.

Burrard Inlet (*bŭr′rärd ĭn′lĕt*), a narrow inlet of British Columbia, an arm of the Strait of Georgia, a short distance N. of the mouth of the Fraser River. It is 9 m. long and on its northern shore is the city of Vancouver. Its shores are covered with forests of firs, cedars, and pines, and it is noted for its fisheries.

Burrillville (*bŭr′rĭl-vĭl*), a town of Rhode Island, in Providence County, 22 m. N.W. of Providence. It is situated on the New York, New Haven & Hartford Ry., and near it is Wallum Lake, a popular summer resort. The manufactures include textiles and machinery. Population, 1940, 8,185; in 1950, 8,774.

Burritt (*bŭr′rĭt*), ELIHU, known as the "Learned Blacksmith," born in New Britain, Conn., Dec. 8, 1810; died Mar. 6, 1879. He learned the trade of a blacksmith and settled at Worcester, Mass. He devoted his leisure to the study of languages, mathematics, and sciences. Later he became editor of the *Christian Citizen*, advocating temperance, peace, education, and the emancipation of the slaves. Later he traveled in America and Europe, lecturing and seeking converts to his doctrines. He was appointed consul to Birmingham, England, in 1865. Among his best-known works are "The Mission of Great Suffering," "Works in the Black Country," "Chips from Many Blocks," and "Handbook of the Nations."

Burroughs (*bûr′ōz*), JOHN, essayist, born near Roxbury, N.Y., April 3, 1837; died on March 29, 1921. After local schooling, Burroughs financed his higher education by teaching. He continued to teach until he went (1863) to Washington, D.C., to become a clerk in the U.S. Treasury Dept. Before retiring (1873) to a farm in the Catskills in New York State, he had already published occasional articles and poems and the first of his popular nature essays. He had also written (1867) the first biographical and critical study of Walt Whitman, a longtime personal friend. Burroughs' essays, his primary contribution to American literature, dealt with direct observation of birds ("Wake-Robin," 1871; "Birds and Poets," 1877) and other wildlife. He left his farm, Riverby, and his retreats, Slabsides and Woodchuck Lodge, only to travel—once as far afield as Alaska, from which he drew the book "Far and Near" (1904). His later books reflected a growing interest in science and in the philosophy of science. His "Camping and Tramping with Roosevelt" (1907) grew out of his friendship with Theodore Roosevelt.

Bursa (*bûr′sạ*) or BYRSA, the citadel of ancient Carthage (*q.v.*), the first part of the city to be built. Its name, apparently derived from the Phoenician *bosra* or *borsa*, meaning "fortress," was corrupted by the Greeks to *bursa*, their word for "hide." The last may have given rise to the legend that Dido (*q.v.*) marked out the area of Carthage with strips of hide.

Bursa (*bŏŏr-sä′*), BRUSA, BRUSSA, OF BROUSSA, a city in northwestern Turkey, capital of a vilayet (province) of the same name (area, *ca*. 3,850 sq. m.; 1955 pop., 613,263). The city is located *ca*. 50 m. S. of Istanbul, across the Sea of Marmara. Noted for its silks, tapestries, and carpets, Bursa trades in grains, olives, tobacco, and grapes. As Prusa, *ca*. 200-100 B.C., it was the seat of Bithynian kings; in the 14th century it was a capital of the Ottoman Turks. Population, 1955, 131,336.

Burton (*bûr′tȯn*), HAROLD HITZ, public official, born in Jamaica Plain, Mass., June 22, 1888. He studied at Bowdoin Coll. and at Harvard

Univ. receiving his LL.D. in 1912. Subsequently, he held several positions with law firms, was attorney for a number of utility companies, and taught corporation law at Western Reserve Univ. His political career began in 1929, when he gained a seat in the Ohio house of representatives, after which he was mayor of Cleveland (1935-40) and U.S. Senator from Ohio (1941-45). In 1945 President Truman appointed him to the U.S. Supreme Court, on which he served until his retirement in 1958.

Burton, JOHN HILL, historian, born in Aberdeen, Scotland, Aug. 22, 1809; died Aug. 10, 1881. He studied at Marischal Coll., Aberdeen, and was admitted to the bar, but gave attention chiefly to literary work. Many of his writings consist of contributions on law and history to prominent periodicals, and he contributed to a large number of works of reference, including Chambers's Encyclopedia. Among his books are: "History of Queen Anne's Reign," "Life and Correspondence of David Hume," and "History of Scotland from Agricola's Invasion to the Revolution of 1688."

Burton, RICHARD, poet and lecturer, born in Hartford, Conn., Mar. 14, 1861; died Apr. 8, 1940. Receiving his A.B. from Trinity Coll., Conn., in 1883, he went on to Johns Hopkins Univ. where he was awarded his Ph.D. five years later. He taught at Johns Hopkins for a year and then traveled in Europe, returning in 1890 as literary editor of the Hartford *Courant.* In 1898 he became head of the English department at the Univ. of Minnesota, leaving in 1902 to work as editor for the Lothrop Publishing Co. and as lecturer at the Univ. of Chicago. He returned to the Univ. of Minnesota in 1906, and remained there until 1925 when he resigned to devote his time to literary work, lecturing meanwhile at Columbia Univ. and Sarah Lawrence Coll. From 1918 to 1935 he was a member of various Pulitzer Prize Committees, serving from 1924 to 1929 as chairman of the committee on fiction. Burton returned to academic work in 1933 as professor of literature at Rollins Coll., Florida, where he remained until his death in 1940. While at Rollins he also served as editor of the department of literature for the screen for Warner Brothers Pictures. His long list of writings include, in addition to his poetry, fiction and essays on poetry and drama.

Burton, SIR RICHARD FRANCIS, traveler, born in Hertfordshire, England, Mar. 19, 1821; died at Trieste, Austria, Oct. 20, 1890. He was educated in his native country and France, entered the Indian service in 1842, and explored Arabia in the disguise of an Afghan pilgrim, having previously learned to speak Arabic like a native. He was master of 36 languages and dialects. He served in the Crimean War, was consul at Fernando Po; at Santos, Brazil; at Damascus; and at Trieste, where he died. His many works include: "The Nile Basin," "First Steps in East Africa," "Wanderings in West Africa," and a translation of the "Thousand and One Nights." He was accompanied by his wife, Isabel Burton, who died Mar. 23, 1896. She was also a writer, and among other books published: "The Inner Life of Syria" and "Arabia, Egypt and India."

Burton, ROBERT, clergyman, born at Lindley, England, Feb. 8, 1577; died Jan. 25, 1640. He studied at Brasenose Coll., Oxford, and became vicar in that city. His "Anatomy of Melancholy" has gone through many editions. It is a medley of reflections and quotations from the pen of a genius and scholar.

Burton-on-Trent (*bûr′tŏn-on-trĕnt*), a town of Staffordshire, England, on the Trent River, 20 m. E. of Stafford. It is surrounded by a level country, producing cereals, fruits and live stock. The river is crossed by a stone bridge with 29 arches, and it has transportation facilities by several railroads and the Grand Trunk Canal. Among the public buildings are a public library, a college, and many churches and hospitals. The manufactures include ale, clothing, cotton goods, and machinery. The breweries are among the largest in the world. Burton was incorporated in 1878. Population, *ca.* 50,000.

Burwash (*bûr′wäsh*), NATHANAEL, educator, born Argenteuil, Quebec, July 25, 1839. He was educated at Victoria Coll., Coburg, and Yale Univ., and received his theological instruction at the Garrett Institute. In 1860 he entered the ministry of the Methodist Church, and six years later was appointed professor in Victoria Coll., where he became dean of the faculty of theology in 1873. He was made president and chancellor of Victoria Univ. in 1887, a position he held until 1913. As a member of the council of education for the province of Ontario he exercised a wide influence. His publications include: "Wesley's Doctrinal Standards," "Inductive Studies in Theology," "Handbook on the Epistle to the Romans," "Manual of Christian Theology," and "Life and Times of Egerton Ryerson." He died in 1927.

Bury (*bĕr′ĭ*), a town in Lancashire, England, 8 m. N. of Manchester. It is the seat of manufactures of woolen goods, fabrics, machinery, ironware, and dyestuffs. A statue of Sir Robert Peel, who was born near here, adorns the public park.

Bus (*bŭs*). See *Motor Bus.*

Busch (*bo͝osh*), FRITZ, conductor, born in Siegen, Germany, March 13, 1890; died in London, England, Sept. 14, 1951. After studying at the Cologne Conservatory, he made his debut at the State Theater in Riga, Latvia. Engagements in Germany followed, and in 1922 he was appointed general music director of the Dresden Opera, which, under his guidance, excelled in the operas of Mozart, Wagner, and several modern composers. Except for his trip to the U.S. in 1927 when he appeared as guest conductor of the N.Y. Symphony Society, Busch remained at his post in Dresden until 1933 when he left Germany as a political refugee. He was guest conductor of the N.Y. Philharmonic Symphony Orchestra (1942) and of the Metropolitan Opera Assn. (1945-49). A citizen of Argentina (1936), he also directed at the Teatro Colon, Buenos Aires.

Courtesy C.B.S.

FRITZ BUSCH

Bush (*bo͝osh*), VANNEVAR, scientist, born in Everett, Mass., March 11, 1890. He was graduated from Tufts Coll. in 1913 and taught mathematics there in 1914-15. During World War I, he worked on submarine-detecting devices. Bush joined the faculty of the Massachusetts Inst. of Technology in 1919 and was vice president and dean of engineering in 1932-38; a life member of the M.I.T. Corp., he became honorary chairman of the corporation in 1959. An electrical engineer, he built a differential analyzer—a machine for solving differential equations—in the 1920's. He was head of the Carnegie Institution of Washington in 1939-55 and became a trustee in 1955. He was a regent of the Smithsonian Institution in 1943-55. He received many awards and honorary degrees.

Photo by Harris & Ewing

VANNEVAR BUSH

Bush is best known to the general public for his connection with official World War II research projects, including that for developing the atomic bomb. He headed the Office of Scientific Research and Development (1941-46), the Joint Research and Development Board (1946-47), and the National Research and Development Board (1947-48). Besides scientific papers, he wrote "Modern Arms and Free Men" (1949).

Bushbuck (*bo͝osh'bŭk̦*), or BOSCHBOK, an antelope of South Africa, so named from its habit of frequenting the thick underbrush. It is easily caught in the open country. The body is from 4 to 5 ft. long and about 3 ft. high, and the horns are triangular. It is prized for its venison. A similar animal known as white-backed bushbuck is native to Sierra Leone.

Bushel (*bo͝osh'ẹl*), a measure of capacity, containing eight gallons or four pecks, used in measuring dry quantities. The standard U.S. bushel contains 2,150.42 cu. in., and the standard measure is 8 in. deep and 18½ in. in diameter, inside measurement. The imperial bushel of Great Britain has a capacity of 2,211.192 cu. in., equal to 80 pounds of distilled water.

Bushido (*bo͞o'shē-dō*), the ethical code of the Samurai (*q.v.*) of Japan, glorifying loyalty, honor, justice, benevolence, courtesy, and self-control.

Bushmen (*bo͝osh'mẹn*), or BOSJESMANS, a native race of South Africa, who dwell in the region of the Orange River. They live in caves and clefts in the mountains, or in holes in the ground covered with roofs of reeds. They support themselves chiefly by hunting and trapping and by gathering berries, roots, insects, and reptiles, which they eat about half cooked. They have numerous legends and do a rude form of painting, but their language is very simple.

Bushnell (*bo͝osh'nẹl*), DAVID, American inventor; born in Connecticut in 1742; died in 1824. He was graduated from Yale in 1775 where he took much interest in natural science, and on one occasion demonstrated to the faculty that gunpowder would explode under water. In 1775 he completed a man-propelled submarine, called the "American Turtle," because its oak frame suggested the joined shells of two turtles, so weighted that the tail pointed straight downward. It held a wooden magazine containing gunpowder, and a time-clock for setting it off, which could be attached to boats in the harbor to explode at a later time. The submarine was equipped with a vertical and horizontal screw-propeller and rudder, operated by hand from inside. A phosphorus-lighted compass showed the boat's direction, and a water gauge its depth; a foot-operated valve let water in and hand-operated pumps forced it out again, thus permitting the boat to descend and rise. As skilled operators were difficult to obtain, the submarine did not prove a success, even though it served as the forerunner of the modern submarine.

Bushrangers (*bo͝osh'rān-jĕrz*), a gang of escaped convicts who frequented the forests of New South Wales, 1810-80. They robbed banks, plundered villages, and laid tribute on the settlers. Subsequently they infested Van Diemen's Land and frequented the mountainous districts of eastern Victoria. Martial law was proclaimed by the governor in 1815, but the last of their gang was not executed until 1880, when three were shot at Melbourne.

Business College (*bĭz'nĕs kŏl'ĕj*), an institution in which students of both sexes are trained for commercial employment. These schools have been promoted for many years, or departments doing similar work have been maintained in public schools or normal colleges, but since the middle of the last century they have multiplied greatly. This is due to the fact that stenography, typewriting, and teletyping have demanded more attention, and through these branches of study all lines of office work have been modified to a great extent. Business colleges do not only teach the three branches mentioned, but in addition provide courses in bookkeeping, commercial arithmetic, commercial law, commercial geography, and one or more modern languages, especially German, French, or Spanish. All the larger cities of the U.S. and Canada have one or more business colleges, and in these countries commercial departments are maintained in a large number of high schools. Writers of textbooks have supplied outlines and texts suitable for class work in all the branches taught, and these are quite as numerous as those offered for use in public schools or colleges.

Busoni (*bo͞o-zō'nê*), FERRUCCIO BENVENUTO, composer and pianist; born at Empoli, near Florence, Italy, in 1866; died in 1924. He received his early training from his parents, both fine musicians. As a child, he appeared in concerts with notable success and, after 1870, he toured America. Busoni taught in the conservatories of Helsingfors (1888-89); Moscow (1890-91); at the New England Conservatory at Boston (1891-93); Berlin (1895-1909); and directed the Bologna Liceo (1913-15). His reputation as a composer came late, perhaps obscured by his brilliance as a performer and teacher. He composed a number of concertos; two suites and an overture, for orchestra; two string quartets and two violin sonatas; a suite and a serenade for the violoncello; and many compositions for piano. In 1912 his opera, "Die Brautwahl," was produced in Hamburg.

Bust (*bŭst*), in sculpture, the representation of the chest and the upper part of the body. The earliest bust known is that of Scipio Africanus the Elder. Busts were very common in the literary period of Greece and quite extensive in Rome. By means of them we have good representations of the faces of Plato, Socrates, Demosthenes, and many other Greek characters; and of Caesar, Cicero, Cato, and other eminent Romans. However, they are less common among the latter. King Louis I, of Bavaria, made the most celebrated collection that exists, now at the Walhalla, about 7 m. E. of Regensburg (Ratisbon), Germany. Among the busts are 101 representations of eminent Germans.

Bustard (*bŭs'tẽrd*), a bird of the eastern hemisphere, belonging to the order of runners. The great bustard was once common to the British Isles, and is still found in the southeastern part of Europe and in Tartary. It measures 6 to 7 ft. from wing to wing and weighs 30 pounds. The little bustard is common to Europe. Several species are found in Africa and one is native to Australia, but none is found in America. The bustard family is esteemed for food, but attempts to domesticate these birds have failed.

Butadiene (*bū-tȧ-dī'ēn*). See *Chemistry; Rubber, Synthetic.*

Courtesy Brown Bros., N. Y.

FERRUCCIO BUSONI

Butcher Bird (*bŏŏch'ẽr bẽrd*). See *Shrike*.

Butenandt (*bōō'tĕn-ȧnt*), ADOLPH FRIEDRICH JOHANN, chemist, born in Wesermünde, Germany, Mar. 24, 1903. He began his work on hormones after finishing his studies at the Univ. of Göttingen in 1931. Engaged in research first in Danzig and later as professor of chemistry at the Univ. of Berlin and as director of the Kaiser Wilhelm Inst. for Bio-Chemistry, Butenandt became famous for his discoveries in the chemical structure of hormones. In 1939, for his research on sex hormones, he was awarded the Nobel Prize in Chemistry. He refused, however, due to Nazi regulations which forbade Germans to accept the prize.

Butler (*bŭt'lẽr*), a borough in Pennsylvania, county seat of Butler County, about 23 m. N. of Pittsburgh, on the Bessemer & Lake Erie, the Pennsylvania and other railroads. It has a growing trade in minerals and farm produce. Among the chief buildings are the county courthouse, the public library, and several banks and business houses. The city is in the natural gas and oil belt. It has extensive flour, woolen, and planing mills and factories producing plate glass, railroad cars, refrigerators. The site was owned by Robert Morris. It was laid out in 1803. Population, 1900, 10,853; in 1930, 23,578; in 1940, 24,477; in 1950, 23,482.

Butler, BENJAMIN FRANKLIN, soldier and statesman, born in Deerfield, N.H., Nov. 5, 1818; died Jan. 11, 1893. He was graduated from Waterville Coll., Maine, and was admitted to the bar in 1841. In 1853 he became a member of the Massachusetts Legislature, was elected to the state senate in 1859, and attained eminence in the practice of law at Lowell. He was a delegate to the national Democratic convention at Charleston in 1860, and took part in the adjourned session held at Baltimore. At the beginning of the war he was appointed brigadier general, and on April 17 marched to Annapolis, Md., and occupied Baltimore without opposition. For this he was rewarded by President Lincoln, who commissioned him major general in the federal service. He captured Ft. Clark and Ft. Hatteras soon after, and the next year led an expedition to the Gulf of Mexico. He landed at New Orleans on May 1, 1862, and immediately took possession of the city, remaining there until December, when he was relieved by Maj. Gen. Banks. In 1863 he commanded the troops in Virginia and North Carolina, the next year suppressed riots in New York, and returned to Massachusetts in 1865. He was elected to Congress as a Republican the next year and served until 1879, with the exception of the term beginning in 1875. In 1882 he was elected governor of Massachusetts as the Democratic nominee, and in 1884 was the Presidential candidate of the Greenback-Labor and Anti-Monopoly parties. He received 133,000 votes, but carried none of the states. Butler was a prominent factor in the reconstruction of the Southern states, and in the impeachment of President Johnson. He took high rank among the ablest jurists and statesmen of his time.

Butler, JOSEPH, theologian, born at Wantage, Eng., May 18, 1692; died June 16, 1752. He was graduated from Oriel Coll., Oxford, and entered the ministry of the Presbyterian Church. In 1738 he was made Bishop of Bristol, and after 12 years was transferred to Burham. His chief literary work is entitled "The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature."

Butler, NICHOLAS MURRAY, educator, born in Elizabeth, N.J., Apr. 2, 1862. He attended the public schools, was graduated from Columbia Univ. in 1882, and subsequently studied in Berlin, Germany. After holding a number of minor positions at Columbia Univ., he was made professor of ethics, philosophy, and psychology, and in 1890 was chosen first dean of the faculty of philosophy. He was the first president of the New York Coll. for the Training of Teachers, now the Teachers' Coll., and in 1894 served as president of the National Educational Association. In 1901 he succeeded Seth Low as president of Columbia Univ., which institution of learning improved greatly under his leadership. He remained president until October 1945. He edited: "The Teachers' Professional Library," "The Great Educators' Series," and "Columbia Uni-

NICHOLAS MURRAY BUTLER

versity Contributions to Philosophy and Education." Among his many addresses, essays, and published papers are: "Education in the U.S." (1900); "What Is Progress in Politics," (1913); "Building the American Nation" (1923); "The Path to Peace" (1930); and "Across the Busy Years" (an autobiography, 1939). In 1931 he received the Nobel Peace Prize jointly with Jane Addams (*q.v.*). In 1946 he revealed that he had become totally blind, and he died in 1947.

Butler, SAMUEL, author and composer, born at Langar, England, Dec. 4, 1835; died at London, June 18, 1902. Educated at Shrewsbury School and Cambridge Univ., Butler intended to enter the ministry. He did parish work in London, but his opinion prevented him from carrying out his intentions. In 1859 he sailed to New Zealand to become a sheep farmer. After five successful years he returned to London and undertook the study of music and art. With Henry Festing Jones he composed several gavottes, as well as a cantata entitled "The Narcissus." He also became a fairly proficient painter, and from 1868 to 1876 he exhibited his work annually at the Royal Acad. However, in 1877, with the publication of "Life and Habit," he realized that his life's work was destined to be writing, and from that date until his death most of his time was spent on his literary endeavors. He was a master of irony, having no equal among his contemporaries, and many of his works were directed against the theory of evolution as then being expounded by Charles Darwin. His most popular literary work, "The Way of All Flesh," was not published, however, until 1903, one year after his death.

Butler, WILLIAM ALLEN, author and lawyer, born in Albany, N.Y., Feb. 20, 1825; died in 1902. He was graduated from New York Univ., studied law in the office of his father, Benjamin F. Butler, and built up a successful practice in New York City. His satire entitled "Nothing to Wear" was first published in *Harper's Weekly,* and was subsequently issued in book form.

Butler, WILLIAM ORLANDO, soldier and statesman, born in Jessamine County, Kentucky, in 1791; died Aug. 6, 1880. He studied at Transylvania Coll. and was admitted to the bar, but entered the military service at the outbreak of the War of 1812. In 1813 he took part in the two battles on Raisin River and was wounded, and in 1815 rendered service in the Battle of Chalmette, better known as the Battle of New Orleans. He took up the practice of law in 1817, served three terms in the Kentucky State Legislature, and was a member of Congress, 1839-43. In 1844 he was a candidate for governor on the Democratic ticket, but was defeated by the Whig candidate, who received a greatly reduced majority. During the Mexican War he commanded as a major general of volunteers, distinguished himself at Monterey and the City of Mexico, and superseded Scott as commander of the American army shortly before the close of the war. In 1848 he was nominated for Vice President on the ticket with Cass. He published "The Boatman's Horn, and Other Poems."

Butte (*būt*), a name sometimes applied to mountains whose peaks are more than 8,500 ft. above the sea. In this sense the word is used quite frequently in Canada and England, and to some extent in the U.S., but in the last-mentioned country it applies more generally to a hill or knoll rising abruptly on a plain or plateau. Many small buttes are located in the Rocky Mts. and on the high plains of North Dakota and eastern Montana. They were formed by the erosion of ancient plateaus, being the more solid portion of earth or clay mixed with rock.

Butte, a city of Montana, county seat of Silverbow County, 64 m. s. of Helena, on the Great Northern, the Northern Pacific, the Chicago, Milwaukee & St. Paul, and other railroads. In its vicinity are productive deposits of gold, silver, and copper. The chief buildings include the county courthouse, the State School of Mines, and the city hall. Its principal industries are mining, smelting and refining. The manufactures include cigars, clothing, earthenware, and machinery. It has a large local and jobbing trade. Butte was settled in 1864 and was first incorporated in 1879. Population, 1900, 30,470; in 1930, 39,532; in 1940, 37,081; in 1950, 33,251.

Butter (*bŭt'tẽr*), the fatty substance of milk or cream solidified by churning. Formerly butter was made wholly of cream that was collected from time to time by skimming the surface of milk, where it accumulates by gravitation. This method is still employed on the smaller farms, but in dairying it has been superseded by the use of the cream *separator* (*q.v.*). After a sufficient quantity of cream has been gathered, it is placed in a *churn,* or in some other suitable apparatus, and is agitated until butter forms. When the churning has been finished, the butter is taken out and is worked thoroughly to free it from milk, and about two per cent of salt worked into it. The milk of a well-fed cow contains about four per cent of butter. In the newer process of making butter by separating the cream from the milk by a separator, the centripetal principle of revolution is applied to the process, and later the cream is agitated in a churn propelled by steam or electric power. In the larger creameries the whole milk is churned. The agitation in churning ruptures the fat globules and causes them to collect in masses.

Much care must be exercised in the packing and storage of butter, as it is very sensitive to its environments and its flavor is easily impaired. When the butter is delivered by the creamery to the cus-

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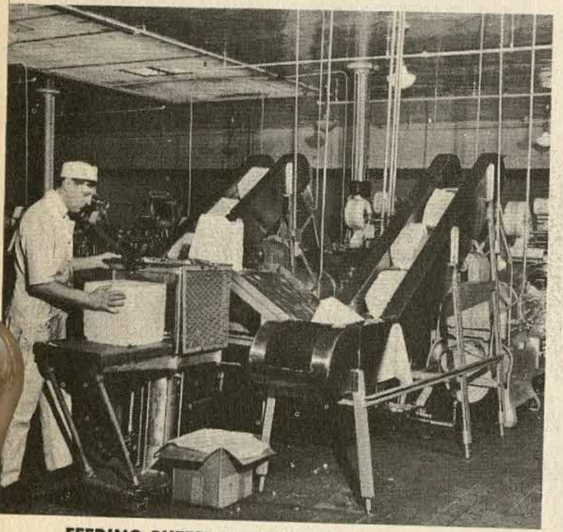
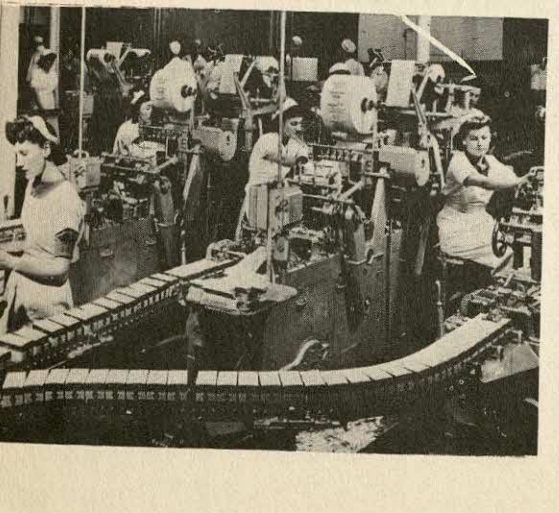
BUTTER CHURN

After taking the butter from the churn, it is weighed



FEEDING BUTTER TO THE BUTTER PRINT MACHINE

BUTTER PACKING MACHINE



tomer or is shipped only a short distance, it is usually put up in the form of bricks, but when shipped a long distance it is packed in tubs or firkins. Farmers either make the butter themselves and sell it to grocers, or they sell the milk or cream to the creamery or cheese factory. The modern refrigerator cars and cold-storage plants permit transporting butter long distances or keeping it many months without danger of injury.

The production of butter is an important industry. Denmark and Holland excel all other countries in the quality of butter produced, and both are large exporters. The butter industry of Canada and the U.S. has grown constantly in the 20th century, owing to the introduction of the creamery system. The annual production in the U.S. is valued at $275,500,000. Chicago, New York, and Boston are the leading butter markets, but it is an article of extensive commerce in many localities and in most countries. An artificial butter, called oleomargarine, is made of beef fat, or suet, and vegetable oils. A general law places a heavy tax upon it, in order to protect the production of dairy butter. However, it forms an important article of commerce.

Buttercup (*bŭt'tẽr-cŭp*), a name popularly given to several varieties of plants of the ranunculus family. The taller species grow to a height of 2 or 3 ft., the smaller varieties form runners, while others grow in water. They flower in May; the flowers have a shining yellow color and are double in several species. They were so named because of the misconception prevalent at one time that the yellow color of butter was due to cattle eating them.

Butterfield (*bŭt'tẽr-fēld*), DANIEL, soldier, born in Utica, N.Y., Oct. 31, 1831; died July 17, 1901. He attended public schools and Union Coll., from which he was graduated in 1849, and later engaged in the express business. In 1861 he joined the Federal army. The same year he was raised to the rank of brigadier general of volunteers, and commanded a corps in the Peninsular campaign at Gaines' Mill, where he was wounded. He commanded in the second Battle of Bull Run, and took part in the battles at Fredericksburg, Chancellorsville, and Gettysburg. In 1863 he was with the army of the Cumberland at Chattanooga, and subsequently marched with Sherman through Georgia to the Atlantic. He resigned from the service in 1869, was U.S. Treasurer at New York City in 1870, and had charge of the Washington centennial parade in New York City in 1889. In 1862 he published "A System of Calls, Picket and Outpost Duty, Corps Badges and Flags."

Butterfly (*bŭt'tẽr-flȳ*), the common name of a large class of diurnal insects, that is, insects which are active during the daytime. The butterflies and moths constitute the Lepidoptera, or scaly-winged insects. They exhibit much similarity to other kin-

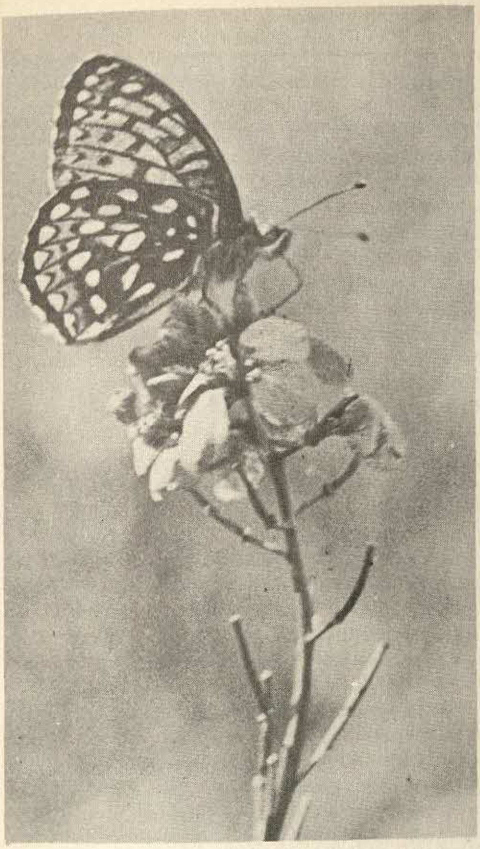


Photo by L. J. Merwin; Am. Wildlife Inst., Wash., D. C.

FRITILLARY BUTTERFLY

Extracting nectar from a mustard flower

dred insects. Many species are found in all parts of the world, though in some regions they are seen only in the summer season. They are more numerous in the tropical climates than in the colder zones. They are found as far north as Greenland and Spitzbergen, where they subsist upon the arctic flowers, while in warmer climates they inhabit the shade of moist foliage in the woods and jungles. Most species fly by day, while the hawk moths move about by twilight, and the moths by night.

The life of the butterfly may be divided into three periods or stages. It begins when the *larva* or *caterpillar* is hatched from the egg, when it is wormlike in form. In this stage it lives from 3 to 10 months, depending upon the locality and the season, and during all this time it takes in food with much greediness. During the second stage, when it is known as the *pupa* or *chrysalis*, it takes in no food whatever. While in this period of development, the pupa of the moth is inclosed in a cocoon of silk, while that of the butterfly is incased in a chrysalis with a hard outer case. Some species remain in this stage only a few weeks, but some do not emerge from it before the following spring. In the third stage the insect is known as the *imago* or *perfect insect.*

The eggs are laid on the leaves of plants, but only the kinds fed on by caterpillars are selected for the purpose; the eggs are hatched by the heat of the sun. When laid in the summer, they hatch in a few days, but in cold climates the eggs hatch in the spring following their deposit. When hatched in the spring, they live as caterpillars during the greater part of the summer, while those hatched late in the summer remain in the chrysalis or pupa state during the winter and develop into butterflies in the spring.

Butterflies have four wings. These are richly colored on both sides and are separate from each other and held upright when at rest. The wings are covered with beautiful scales or feathers, as perfect as those found in the most beautiful birds, but so small that several hundred thousand may occupy a square inch. The wings possess great power, considering the size of the insect, and many species are able to soar in the air with a steady and continuous motion, while others in the tropical regions are migratory, often moving many miles in large numbers. The smaller species have a zigzag flight, and stop to rest frequently.

Butterflies are admired for their beauty. They are active in delightful weather, and are usually associated with the most beautiful vegetation and natural scenery, but the caterpillar is a very uncouth-appearing insect and gives annoyance by its ravages in fields and gardens. Some caterpillars are associated in large colonies, sometimes several hundred, and in this form are very destructive to fruit trees, especially apples and plums. The fully developed butterflies are short-lived, serving the purpose of depositing their eggs and then dying. There are no less than 50,000 species in the different climates, and about one-eighth of them are found in America north of Mexico. The species include every color, and in size range from very small insects to the largest (found in tropical countries), some measuring nearly a foot across the wings. Some are remarkable for the likeness they bear to the leaves, flowers, bark, or vegetable life on which they feed, this often serving as a protection against their enemies. See also color plates, *Butterflies of the World I and II, Butterflies of Eastern and Southern U.S.,* and *Butterflies of the Western Hemisphere,* Volume I.

Butterfly Weed (*bŭt′tẽr-flȳ wēd*), a plant native to North America, found widely distributed in Canada and the U.S. It is allied to the so-called milkweeds, and is known in some sections as *pleurisy root.* It has bright orange-colored flower clusters and the root is used as a medicine, chiefly as an expectorant.

Butterine (*bŭt′tẽr-ĭn*). See *Oleomargarine.*

Buttermilk (*bŭt′ẽr-mĭlk*), an acidulous liquid obtained by separating butter fat from cream by churning. Originally regarded as a waste product and fed to cattle, its high nutritive value makes it an important food product for humans.

Butternut (*bŭt′ẽr-nŭt*), or WHITE WALNUT, a wide-spreading forest tree of America. It ranges from the Atlantic to the Missouri River and beyond, has nearly smooth bark and serrated and pointed leaves, and grows to a height of 50 to 75 ft. It flowers in May and bears an oblong-ovate nut that ripens in September. The kernel is much used for eating, while the bark yields a dye, and the wood is useful for cabinet work and for fuel. It is not so valuable as the wood of the black walnut, being lighter in weight and less hardy.

Butterwort (*bŭt′ẽr-wûrt*), a plant common to the marshy grounds of Europe and Canada. The flowers of most species are purple in color, and have a two-lipped calyx. The leaves are thick and somewhat greasy to the touch, and secrete a glutinous fluid that holds small insects, which are consumed by the plant for food.

Butterworth (*bŭt′ẽr-wûrth*), BENJAMIN, lawyer and statesman, born in Warren County, Ohio, Oct. 22, 1837; died in Thomasville Ga., Jan. 16, 1898. He was appointed to the office of commissioner of patents by President Arthur in 1883, to which position he was reappointed in 1897 by President McKinley. He was the author and tireless supporter of the compulsory army retirement act.

Button (*bŭt′’n*), a small circular disk used chiefly to fasten together parts of dress and for ornamentation. It is made of a large variety of materials, including pearl, bone, horn, wood, ivory, copper, rubber, and brass. The manufacture of buttons is an enterprise of vast importance, though as such it does not date to remote antiquity. An article of this kind was not used to any great extent by the Greeks and Romans, who fastened their loose garments with strings and girdles, or used pins, brooches, or buckles. Hooks and eyes have been in use many centuries, but the extensive use of buttons does not date back farther than the 14th century. Birmingham, England, is the chief center of the manufacture of buttons in Great Britain, and this enterprise is developed quite extensively in Canada. In Germany, the U.S., and many other countries buttons are made to some extent by convict labor in the penitentiaries. The pearl button industry is centered largely along the Mississippi River, in which fresh-water mussels are abundant. Extensive factories are operated at Muscatine and Ft. Madison, Ia., and in many places along the Mississippi River between New Orleans, La., and Red Wing, Minn. Buttons of this class are cut with tubular saws from the shells into the sizes of the buttons desired, after which holes are pierced or drilled, and the button is finished by polishing. Waterbury, Conn., is the center of the metal button industry in the U.S., and large quantities are made in Philadelphia. Glass, porcelain, and gutta-percha buttons are manufactured to a considerable extent. Other kinds are those made of celluloid and papier-mâché. Many civic societies and other organizations, as well as honorably discharged war veterans, wear buttons of metal, usually bronze or brass, on the common garments, and of gold or silver for symbols or ornamentations.

Buttress (*bŭt′rẹs*), in architecture, a support on the outside of tall buildings, used extensively in bridges which bear a heavy superstructure. The Chaldeans built rudimentary buttresses to strengthen the walls supporting heavy vaults or roofs, but the more substantial forms came into use at the time of the Byzantine Empire. In Gothic architecture it is an essential feature, especially the so-called flying buttress, which has an arched form and springs from a heavy pinnacled buttress, serving to support a higher portion of the building by transferring its thrust downward to the exterior buttress. In many styles of buttresses more or less ornamentation has been introduced and some are paneled over the entire surface.

Butyric Acid (*bû-tĭr′ĭk*), one of a number of acids obtained from butter, and contained in various other substances, such as perspiration and cod-liver oil. It is formed in milk by the action of caseine upon the sugar, lactic acid being first formed, and this by its decomposition producing hydrogen and butyric and carbonic acids. When obtained from butter, it is a colorless liquid, and is unpleasant in the odor and taste. Butyric acid gives the rank smell to rancid butter.

Buzzard (*bŭz′ẽrd*), the name of a class of birds of prey belonging to the falcon family. The common buzzard of Europe is large and has a heavy body. It is skillful in catching birds, mice, and poultry. About 10 or 12 species are found in Canada and the U.S., of which three deserve special note; the *turkey buzzard,* the *brown buzzard,* and the *rough-legged buzzard.* The turkey

TURKEY BUZZARD

buzzard is native to the southern states, where it is very common and useful as a scavenger and carrion-vulture, and for that reason is commonly protected by law. This bird is allied to the condor of South America, and, like it, has the head and neck bare. It is about the size of a turkey, is dark or black in color, with wide-spreading wings, and is seen in large numbers hovering around the carcass of a dead animal. The brown buzzard is deep brown in color. It nests in trees and ledges of rocks and feeds on worms, insects, birds, and small mammals. The rough-legged buzzard is feathered to the toes. Buzzards are distributed more or less through all the continents.

Buzzards Bay (*bŭz′ẽrdz bā*), an inlet from the Atlantic Ocean, on the southeast coast of Massachusetts, extending 30 m. to the northeast.

Byelorussian (*bȳ-ẹ-lō-rŭsh′ạn*) **Soviet Socialist Republic,** one of the constituent republics of the U.S.S.R., located on the western border of the U.S.S.R., between the Dnieper, Bug, and Western Dvina Rivers. Known also as *White Russia,* it comprises an area of 81,090 sq. m. and has a population of over 10,000,000. About one-fourth of the territory is forest land. Agriculture, agricultural processing industries, such as meat packing, starch and flax production, distilling, and tanning, are important. The total industrial output has increased 20 per cent in the last 20 years, and Minsk, the capital, has become one of the main industrial centers. Other important cities are Mogilev, Belostok, Grodno, Vitebsk, and Gomel. The Byelorussian S.S.R. was founded in 1919 and became a part of the U.S.S.R. when it was formed in 1922. Following World War I, a part of Byelorussia between the Bug and Dnieper Rivers became Polish territory. As a result of the German-Russian pact of 1939 this section was incorporated into the Byelorussian S.S.R. after Germany defeated Poland (1939). Byelorussia bore the first brunt of the German invasion in World War II. Rehabilitation of its occupation-ravaged industry was a major postwar task. The republic was an original member of the U.N. Its schools include an Acad. of Sciences and 30 institutions of higher learning.

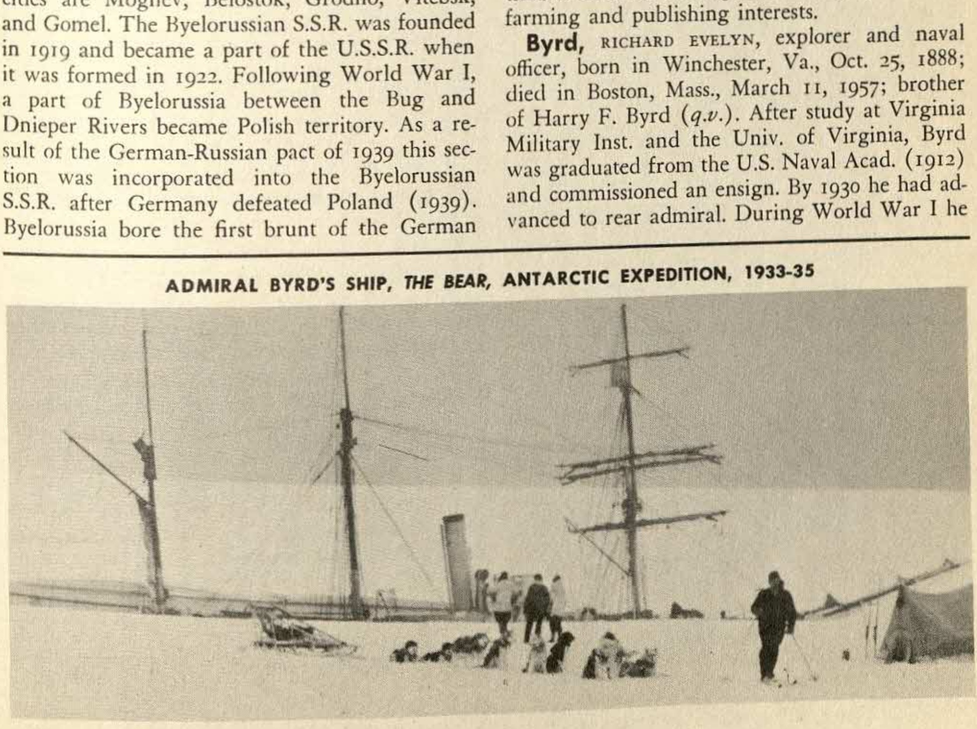
Bylaw (*bī′lạ*), an organic law or regulation made by the members of a corporation, society, or some similar body to govern its members, officers, or executives in the official proceedings.

Byng (*bĭng*), JULIAN HEDWORTH GEORGE, 1ST VISCOUNT BYNG OF VIMY, field marshal, born in England, Sept. 11, 1862; died in Essex, June 6, 1935. A noted general of World War I, Byng derived his title from his leadership of the Canadians at Vimy Ridge in 1917. He also took part in campaigns at the Dardanelles (1915) and at Cambrai (1917). Made a baron in 1919, he was created a viscount in 1926, after serving as governor general of Canada in 1921-26. He became a field marshal in 1932.

Byrd (*bûrd*), HARRY FLOOD, U.S. Senator, born in Martinsburg, W. Va., June 10, 1887; brother of Richard E. Byrd (*q.v.*). He left school at 15 to manage the family newspaper, later became interested in fruit orchards, and, in 1915-25, served in the Virginia state senate. In 1926-30 he was governor of Virginia. Byrd was first seated in the U.S. Senate in 1933. Deriving his support from a coalition of right-wing Democrats and Republicans, he has, in Congress, attempted to control waste, curb bureaucracy, and prevent labor agitation. In addition to his public career, Byrd retains farming and publishing interests.

Byrd, RICHARD EVELYN, explorer and naval officer, born in Winchester, Va., Oct. 25, 1888; died in Boston, Mass., March 11, 1957; brother of Harry F. Byrd (*q.v.*). After study at Virginia Military Inst. and the Univ. of Virginia, Byrd was graduated from the U.S. Naval Acad. (1912) and commissioned an ensign. By 1930 he had advanced to rear admiral. During World War I he

ADMIRAL BYRD'S SHIP, *THE BEAR,* ANTARCTIC EXPEDITION, 1933-35



RICHARD E. BYRD

JAMES F. BYRNES

was in the aviation service and later was instrumental in the creation of the Bureau of Aeronautics in the Navy Department.

In 1925, he assumed command of the naval aviation unit of the Macmillan Polar Expedition in arctic lands. He and the late Floyd Bennett made the first airplane flight over the North Pole (May 9, 1926). For this feat, he was presented with the Hubbard Gold Medal for "valor in exploration" and with the Congressional Medal of Honor. In 1927, with three others, Byrd crossed the Atlantic by plane from New York to France, covering the 4,200 m. in 42 hours. On his first expedition to the Antarctic (1928-30), Byrd and three members of the expedition made the first flight over the South Pole (Nov. 28-29, 1929). On this and the subsequent expeditions under his command (1933-35, 1939-40, 1946-47, 1955-56), much Antarctic territory, previously unknown and/or uncharted, was explored and mapped. Byrd wrote several books on his explorations: "Skyward" (1928); "Little America" (1930); "Discovery" (1935), and "Alone" (1938). See *Polar Explorations.*

Byrnes (*bĕrnz*), JAMES FRANCIS, jurist and public official, born in Charleston, S.C., May 2, 1879. A student after the working day, he passed his bar examinations. After several years of legal practice, he was elected to the U.S. Congress in 1911, serving until 1925, when he resumed his law practice in Spartanburg, S.C. He was elected in 1930 to represent South Carolina in the U.S. Senate, resigning July 8, 1941, when he was appointed associate justice of the U.S. Supreme Court, a position he held until October 1942, when he became director of the U.S. Office of Economic Stabilization and director of mobilization and reconversion (Oct. 4, 1944); in these capacities he directed the economic affairs of the country at war and prepared the transition of a war-geared industry to peacetime requirements. In June 1945, President Truman appointed him Secretary of State; in this position Byrnes took part in several international conferences (*e.g.*, at Potsdam and Moscow). He was one of the first to interpret Russian policy as a challenge to the "one world" concept of the Western nations. Byrnes inaugurated a policy of negotiation which recognized Russia's drive for international dominance, a policy continued by his successor, George C. Marshall (*q.v.*). Later, as governor of South Carolina (1951-55), he tried to promote the maintenance of strict racial segregation. His autobiography, "Speaking Frankly," appeared in 1947.

Byron (*bī'rŭn*), GEORGE NOEL GORDON, LORD BYRON, poet, born in London, Jan. 22, 1788; died at Missolonghi, Greece, April 19, 1824. George Gordon succeeded to the title of his great-uncle and became the sixth Lord Byron when he was ten years old. Both pampered and neglected by his mother, Byron had almost no formal education until he entered Harrow in 1801. From Harrow he went to Cambridge (1805).

In 1807 Byron printed his first book, for private circulation. In 1808 "Hours of Idleness," his first publication, appeared. This volume is less important for itself than because it led to the composition of one of Byron's most famous poems. "Hours of Idleness" was reviewed in unusually harsh terms in the *Edinburgh Review,* one of the most influential of the 19th-century magazines. Self-centered, sensitive, proud, and vain, Byron responded with his satirical poem "English Bards and Scotch Reviewers." This poem, pub-

LORD BYRON

lished in 1809, resulted in immediate fame and great popularity for Byron.

In 1809 Byron made his first visit to the Continent, remaining away from England on a tour of the Mediterranean, for more than a year. During this trip he began his long poem, "Childe Harold," of which the first two cantos were published in 1812, and he also wrote, among other poems, "The Giaour" and "The Bride of Abydos," both published in 1813. With these publications, Byron became the most famous of the English poets of his generation and was not rivaled in popularity during his lifetime.

From this time on one of the most famous of Englishmen, Byron also became one of the most notorious, engaging in one scandalous love affair after another. In 1815 he married Anna Milbanke, later Baroness Wentworth in her own right. The marriage was unhappy. Shortly after the birth of their daughter in 1816, Lady Byron left her husband, in the midst of rumors and accusations that Byron had been guilty of an incestuous relationship with his half-sister, Mrs. Leigh. Byron left England a social outcast, in spite of his great fame and his rank. The rest of his life he lived in Europe. He continued incontinent, living openly with a series of mistresses.

Byron remained a prolific writer, publishing further cantos of "Childe Harold" in 1816 and 1817; "The Prisoner of Chillon" (1816); "Manfred" (1816); "The Vision of Judgment" (1821), a satirical account of English poetry; and his greatest poem, "Don Juan," in parts from 1819 to 1823. "Don Juan" is perhaps the greatest satirical work produced in England in the 19th century.

Throughout his life, Byron shared with his contemporary romantic poets a lively interest in politics and a passion for political freedom. In 1823 his enthusiasm led him to take active part in the revolutionary movement for the liberation of Greece. In 1824, he joined Greek revolutionary forces at Missolonghi, where he remained for several months, working upon the organization of Greek forces and striving for the unification of the several revolutionary groups. Early in 1824 he became ill and in April he died.

Byron's faults of character are the faults and perhaps the strengths of his poetry: his self-centered pride, his feigned or at least unfounded misanthropy, his mistaken feeling of persecution, and his undisciplined conduct all reflect themselves in his poems. The work of a more stable man might have been without these faults, but it might also have lacked the directness and the passion which characterize the best of Byron.

Byzantine Art *(bī-zăn'tĭn)*, the art resulting as the outgrowth of the rise of Constantinople, when the barbarians of western Europe were pouring into Rome. The city was then called Byzantium, hence the name of this art and of the mighty Eastern Empire. At Byzantium the artists gathered and nursed the sparks of artistic beauty in the Middle Ages, which kindled the fires of modern art, after the Revival of Learning. This art dates from the early part of the 6th century, called the Justinian Age. It was retarded by the fall of the Eastern Empire under the sway of the Crusaders in 1204, and finally terminated with its destruction in 1453. Byzantine painting was executed with care and some degree of skill. The illuminations of the scriptural manuscripts were especially fine, and many examples are still to be seen in the larger public libraries of Europe, as fresh and beautiful in appearance as when they were painted. The most remarkable are found in Italy and were made at the school of Siena. Among them is a picture of the Virgin in the Church of St. Dominico at Siena, by Guido, which was executed in 1221, and is a production of exquisite beauty. Interest in the painting of this time is induced by its influence on the later paintings in Italy of Cimabue, Giotto, and even of Raphael.

The sculptures of Byzantium well deserve admiration and respect, especially when compared with the later plastic works of Rome. All the figures are laden with drapery and costume, which largely obscure the nobler and freer features admired by the ancients. It was influenced more or less in this respect by the spread of Christianity. The most beautiful specimens include the "Forty Saints." While relief work and statuary were profuse, the crosses, candlesticks, plates, lamps, cups, altars bore decorations and were richly adorned with precious metals, mosaics, or frescoes.

Byzantine architecture influenced largely the

Courtesy Metropolitan Museum of Art, N. Y.

BYZANTINE CASKET COVER, 10TH CENTURY

Example of ivory sculpture of Byzantine and early Christian art

construction of public edifices of western Europe, especially the churches of Germany and those built in the early Norman period. The finest work included in this form, and typical of it, is the Church of St. Sophia, still the greatest mosque of Constantinople. It was rebuilt by the order of Justinian and completed in 537 A.D. It was the largest and most magnificent of 25 temples built in the capital, and many similar structures were erected throughout the empire by its pious emperor. Its style influenced the construction of the churches of Ravenna, the St. Mark's at Venice, and many of western Europe; among them is the notable Cathedral of Aix-la-Chapelle, which is purely in the Byzantine style. The style presents endless varieties of the Roman arch, characteristic cupolas, and profuse ornamentation. The fresco paintings, rounded windows, and bold projection moldings, ornamented with foliage, are conspicuous.

Byzantine Empire, a powerful country of antiquity, with its seat of government at Byzantium, now called Constantinople (Istanbul). It is sometimes spoken of as the Eastern, the Lower, the Greek, and East Roman Empire. It came into existence when the Roman Empire was partitioned between Honorius and Arcadius, the sons of Theodosius the Great, who died A.D. 395. Honorius was made emperor of the western portion, which passed to the barbarians in 476. Arcadius became ruler of the Byzantine Empire, which existed nearly a thousand years, from the death of Theodosius the Great to the fall of Constantinople in 1453. The origin of the empire dates back to the removal of the capital of the Roman Empire from Rome to Byzantium by Constantine, in 330 A.D., which city was named Constantinople in his honor. The seat of government was changed partly because the barbaric Germanic tribes were pressing hard against Rome, and because of the spread of Christianity in the East, a consequence following the movement of the Roman influence toward the East. In its greatest prosperity the Byzantine Empire included Syria, Pontus, and Asia Minor in Asia; Egypt in Africa; and Macedonia, Crete, Greece, Thrace, and Moesia (now Bulgaria) in Europe. The territory was successively enlarged and diminished by victory and defeat until the fall of Rome in 476, when its territory was merged into other dominions by reasons of the conquests attained by the Huns, Goths, and Vandals.

The first period of the empire proper dates from 395 to 716. The period is distinguished by the reign of Theodosius II (408-50), partly under the regency of his sister, Princess Pulcheria, who carried on successful wars against the Persians in the east and the ravages of Attila and the Huns in Thrace, in the west. He was succeeded at his death in 450 by his sister, Pulcheria, who reigned with extraordinary dignity, and was succeeded by Leo I. He was succeeded by Zeno the Isaurian (474-91), in whose reign a disastrous fire destroyed the famous library of Byzantium. Within his reign also occurred powerful invasions of the Goths and Vandals.

The reign of Justinian I, known as the Age of Justinian, was the most efficient in the history of the empire. It is distinguished by the rise of painting, sculpture, and architecture. In this reign the empire was extended; the great churches were constructed, including St. Sophia and several hundred others; and the famous "Code of Justinian" was written. He was succeeded by Justinian II, who was unfortunately harassed by the

Persians in the east and the Avars in the west. His reign was followed by Maurice, a weak and lawless ruler, who was overthrown by Heraclius. The latter reigned successfully from 610 to 641. His achievements in war are regarded equal to those of Scipio and Hannibal. Though several possessions were lost, those remaining were closely united and the empire became more distinctly Greek.

From 716 to 1057 followed a period of prosperity. It was marked by successful defenses against the Bulgarians and Saracens. The period witnessed the great internal religious controversy that tended to weaken the empire against foreign foes. The controversy was between the Iconoclasts and the Established Church. The former, who opposed the presence of images in places of public worship, were led principally by Leo III. This long dispute resulted in the separation of the Greek Church from the Roman Catholic Church in the last half of the 9th century; the formal separation occurred at the excommunication of the Greek Church in 1054. In this period the empire possessed various distinguished rulers, among them Empress Irene, who sought to unite the Eastern and Western empires by an endeavor to marry Charlemagne, after blinding her own son, but she failed for want of support in her own nation. In the reign of Constantine VII, in the middle of the 10th century, many Russian and Hungarian princes embraced Christianity and Christianized their people. In the beginning of the 11th century the Bulgarians were conquered, but the Turks began to threaten Italy from the east, while the Normans became aggressive from the west.

From 1057 to 1204 the empire gave evidence of a slow but constant decline, owing to the attacks of the Crusaders and the rise of Turkish power. The Crusaders had a marked effect upon Constantinople as they pressed forward to Asia Minor, and finally came into open conflict with the emperors. Alexis made a treaty with the second Cruaders, by which he was to acquire territory conquered by them, but their plans were not carried out. The Normans in the west became even more powerful in their attacks. However, Constantinople was captured by the Crusaders in 1203, and by them Isaac was restored to the throne, having been previously dethroned by Alexis. The latter and his sons were put to death in 1204.

From 1204 to 1261 the Latins occupied the empire, following the second capture of Constantinople by the Crusaders in that year. It was now commonly called the Latin Empire of Rumelia, and Count Baldwin of Flanders became the first emperor. At this time it was divided into various kingdoms and was made tributary to the Venetians and French. Latin occupation was marked by harmful influences, since both art and culture degenerated, and its former greatness was forever lost. In 1261 the Latin Empire vanished, but many of the smaller principalities still remained essentially intact.

From 1261 to 1453 the final fall was accomplished by the rapid rise of Turkish power. A dynasty was founded by Michael Palaeologus, the ruler of Nicaea, in 1261, which remained in control until the final fall of the empire, and is known as the dynasty of Palaeologi. He made fruitless efforts to reconcile the Latin churches and to unite the Greeks as one mighty people. He was hard pressed by the Turks, but they became even more powerful in the reign of his son, Andronicus II, who lost Adrianople, in 1361, and afterward Macedonia and Albania. Sultan Amurath was succeeded by Bajazet, a strong Turkish warrior, who captured Philadelphia, in Asia Minor, and laid siege to Constantinople, but the city was saved by the Tartars under Timur, who invaded Western Asia, which caused a retreat of the Turks to defend their countries in the east. Various rulers followed successively until the Turks attacked Constantinople with an army of 400,000 men under Sultan Mohammed, Apr. 6, 1453. The garrison of 8,000 men made a noble defense, but was finally conquered, and Constantine, the last of the Byzantine emperors, was slain in the battle. The cross on the dome of St. Sophia was replaced by the crescent of the Moslem. Christianity was exterminated, and the surviving inhabitants were sold into slavery.

The Byzantine Empire had not stood in vain. It served as a mighty bulwark against the rising power of the Turks until the spark of western culture and the spirit of advancement were fanned into a flame that developed the highest learning of modern civilization. It was the means of protecting the treasures of ancient Greece and Rome from destruction by the western tribes in the long period of the Middle Ages, preserving them safely until the rise of learning, which spread like fire over Western Europe after the fall of the last Constantine.

Byzantium (*bĭ-zăn′shĭ-ŭm*), a city founded in 667 B.C., on the Thracian Bosporus, by emigrants from Megara, which rose rapidly into commercial importance. Its situation on the shores commanding Asia and Europe made it a powerful factor in early history. In 330 A.D. its name was changed to Constantinople and it was made the capital of the Roman Empire. See *Constantinople.*

C

C (*çē*), the second consonant and the third letter of the English alphabet, and of all alphabets derived from the Roman. It has the same position in the alphabet as the Greek *gamma,* from which it was derived through curving the form. In the English it has two distinct sounds; before *e, i,* and *y* it is sounded as *s,* and before *a, o,* and *u,* as *ķ*. Before *ķ,* as in trick, it is silent.

In music *C* is used to represent the first note of the diatonic scale of *C* major, corresponding to *do* of the Italian. It is employed as an abbreviation for cent and in expressing the scale of the Centigrade thermometer. In combination with *B,* as B.C., it signifies before Christ.

Cab (*ķăb*), a vehicle for conveying passengers for hire; also the enclosed part of the locomotive in which the engineer and fireman are stationed.

Cabal (*ķȧ-băl′*), a term used to denote a small party united for political or personal ends. It was applied especially to the infamous ministry of Charles II of England in the 17th century, which was constituted of Clifford, Ashley, Buckingham, Arlington, and Lauderdale, the initial letters making the word *cabal.*

Cabala (*ķăb′ȧ-lȧ*), in Jewish theology, a philosophical-theological system which originated shortly after the time of Christ. The word is derived from the Hebrew cabal which means to receive, signifying the fundamental conception of the caballa that everything comes from God, there being no special act of creation, nor any end; the deity is self-perpetuating in its development. Everything alive can be connected with God and symbols and meanings of words are secretly connected with His existence. This conception stimulates curious practices, such as using figures instead of letters of the alphabet, and vice versa. One of the greatest caballists was Rabbi Akiba, 2nd century. During the Middle Ages Rabbi Moses Ben Nachman (Ramban) was the most eminent (1195-1275). Christian writers during the Middle Ages and at the beginning of the Renaissance were also very much interested in the cabala, *e.g.,* Pico della Mirandola (*q.v.*) and Reuchlin.

Cabanatuan (*ķä-vä-nä-twän′*), a city of the Philippines, on the island of Luzon. It is located 120 m. N.E. of Manila and has a growing trade in fruit, tobacco, and merchandise. The buildings consist largely of small huts, but some of the business houses are of brick. Site of a POW camp in World War II. Population, *ca.* 15,000.

Cabbage (*ķăb′ĭj*), the name of a plant which is cultivated extensively for culinary purposes and for feeding cattle. It is native to Europe, and in its wild state attains a height of 2 or 3 ft. The wild plants have no heads, the heads of our garden and field plants having been obtained by propagation. It shows a greater tendency to vary its form through cultivation than almost any other plant, and is esteemed very highly among the vegetables. The familiar species that are cultivated extensively include the *Savoy,* the *broccoli,* the *common cabbage,* and the *cauliflower.* The common cabbage is the most important. It includes the red, or purple, and the white varieties; the delicate Portugal, and the coarser tree or cow cabbage. The stems of the cow cabbage, which reach a height of 10 to 12 ft., are used for walking sticks, umbrella handles, and as material for farm buildings. Cabbage is cultivated on a small scale in many gardens, usually in connection with other vegetables, but in some localities it is grown extensively in large fields. As a food it is boiled, made into *sauerķraut,* or is eaten as a salad. In most climates the seed is sown in a hotbed early in the spring, usually in March, and the plants are set in the ground as soon as the frost is out of the ground. Both early and late species are grown, the former maturing in July and the latter in autumn. The heads may be kept over winter in a cold, damp cellar, or by putting them in pits head down and covering with straw and earth. In the southern portions of the U.S. the cabbage industry is a successful enterprise, and large quantities of the product are shipped to the northern markets almost the entire year.

PURPLE CABBAGE

WHITE CABBAGE

Cabbage Insects (*ĭn′sĕkts*), various insects which infest cabbage plants. The most important follow: (1) Cabbage butterflies, *Pieris rapae* and *P. brassicae,* have white wings with black spots. Their green leaf-eating caterpillars may be controlled on young cabbages with lead arsenate. (2) "Looper" moths, *Autographa brassicae,* have brown and black wings with irregular white spots. The green caterpillar may be identified by its "hunching" motion. (3) Cutworms are the caterpillars of several species of moths and usually hide just under the soil, often eating away the plant stem at its base. (4) Aphids or plant-lice, red, green, or black, suck the plant juices and must be killed with a contact poison. (5) Cabbage maggots are the larvae of a fly, *Chortophila brassicae,* which eat into the stems of older plants.

Cabbage Palm, the name of several species of palm trees, so named from their large terminal buds, which are eaten like cabbage. The trees in the West Indies belonging to this class are species of the *areca* palm, and the cabbage palm of the U.S. is the palmetto.

Cabbage Rose, a species of roses noted for its fragrance, and sometimes called the Provence rose. It is cultivated extensively for the manufacture of rosewater and attar.

Cabinet (*kăb′ĭ-nĕt*), a body of advisers or ministers, usually composed of the heads of executive departments, so named from the cabinet or private apartment in which the monarchs of England consulted their privy councilors. The present Cabinet of England may be said to date from the time of William III, who presided over its meetings, and during his reign the ministry was placed on a Parliamentary basis; that is, all of the members of the Cabinet were members of one or the other of the houses of Parliament. The Prime Minister, who is appointed by the King, selects from the chief officers of the government those he desires to have in his Cabinet. He submits their names to the crown for approval, and he is the presiding officer at the meetings. There is no restriction as to the division of the cabinet officers between the two houses of Parliament, or even as to their number, except that not less than 11 are to be chosen, including the first lord of the treasury, the lord president of the council, the lord chancellor, the chancellor of the exchequer, the lord privy seal, the first lord of the admiralty, and the five secretaries of state. The meetings are secret and no record of the proceedings is kept, and each member is bound by its decisions or must resign from the ministry.

In the U.S. the Cabinet is authorized by the Constitution. The President may require the principal officers of the cabinet departments to submit reports on any subject relating to the duties of their respective offices. The President customarily calls cabinet meetings, at which he acts as presiding officer. From 1913 to 1947, and again after 1953, there were 10 departments, of which those of the Secretary of State, of the Treasury, of War, and Postmaster General were established in 1789. The Attorney General was a member of the 1789 cabinet, although his department was not established until 1870. The Secretary of the Navy became a cabinet officer in 1798, of the Interior in 1849, and the Secretary of Agriculture in 1889. The Department of Commerce and Labor, organized in 1903, was reorganized into two departments of Commerce and of Labor in 1913. In 1947 the departments of the Army (formerly War), Air Force, and Navy (headed by secretaries without cabinet rank) were placed under a newly appointed cabinet-rank Secretary of Defense. In 1953, the Department of Health, Education, and Welfare was established, incorporating the former Federal Security Agency. The President nominates cabinet officers, customarily from his own party, subject to the approval of the Senate. These officers receive a salary of $22,500 per year.

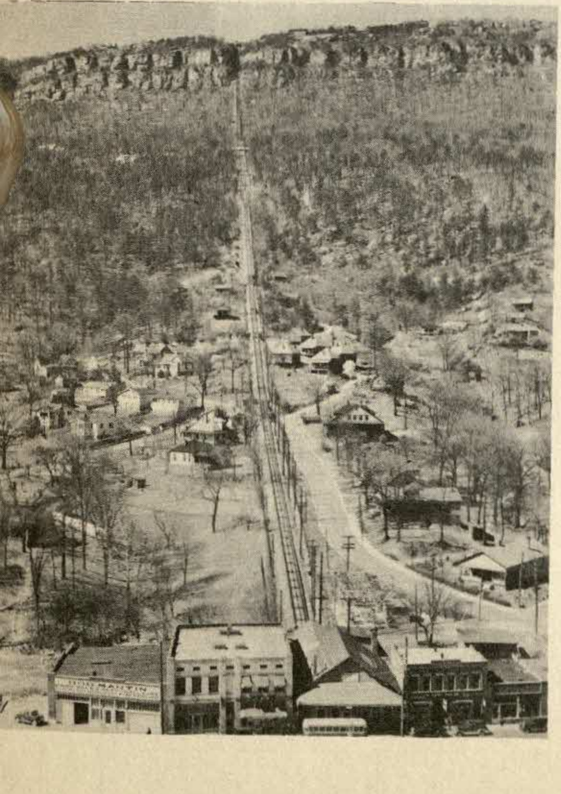
Up to 1947, the Presidential succession law of 1886 was in effect. It provided for the succession to the office of President in case both the President and Vice-President die or are removed from office by conviction after impeachment as follows: the Secretary of State, then Secretary of the Treasury, of War, Attorney General, Postmaster General, Navy, and Interior. The others are not affected by it, because they were not created until some years after the passage of this provision. The 1947 law puts the Speaker of the House, followed by the President *pro tempore* of the Senate, ahead of the Secretary of State, replaces the Secretary of War with the Secretary of Defense, and excludes the Secretary of the Navy. The secretaries whose departments were created after 1886 are added in chronological order of department establishment. The new law is intended to insure that an elected representative of the people serves as President at all times.

The cabinet in Great Britain is necessary to the functioning of the parliamentary system, while in the U.S. the cabinet is an advisory body. The British cabinet is responsible for both law making and administration; in the U.S. the cabinet is almost wholly administrative. The British cabinet is collectively responsible for the action of its members to parliament; the American cabinet members are individually responsible only to the President. While the British cabinet can be removed from office by a vote of lack of confidence, only the President may remove U.S. cabinet members. (They are, however, subject to impeachment by Congress.) There is no principal cabinet officer in the U.S., but the position of Secretary of State is usually regarded as the most important. In most countries the cabinet has similar duties to those discharged by cabinet officers in the U.S., but many are given larger powers, or modified duties are placed upon them. In Switzerland and all the American republics the cabinet is responsible to the Chief Executive, while in any country ruled by a parliament the cabinet is more largely responsible to the legislative branch of the government. See also *United States, Departments of.*

CABLE CAR

This cable car or funicular at Lookout Mountain, Chattanooga, Tenn., travels 4,750 ft. from St. Elmo to the mountain top, reaching a grade of 72° where it climbs the palisades. This passenger incline is operated at a maximum speed of 8 m.p.h. by cables simultaneously wound around two large drums at the top station. Two cables of 1¼-in. twisted steel, weighing nearly 2¼ lbs. per ft., are used to hoist each car

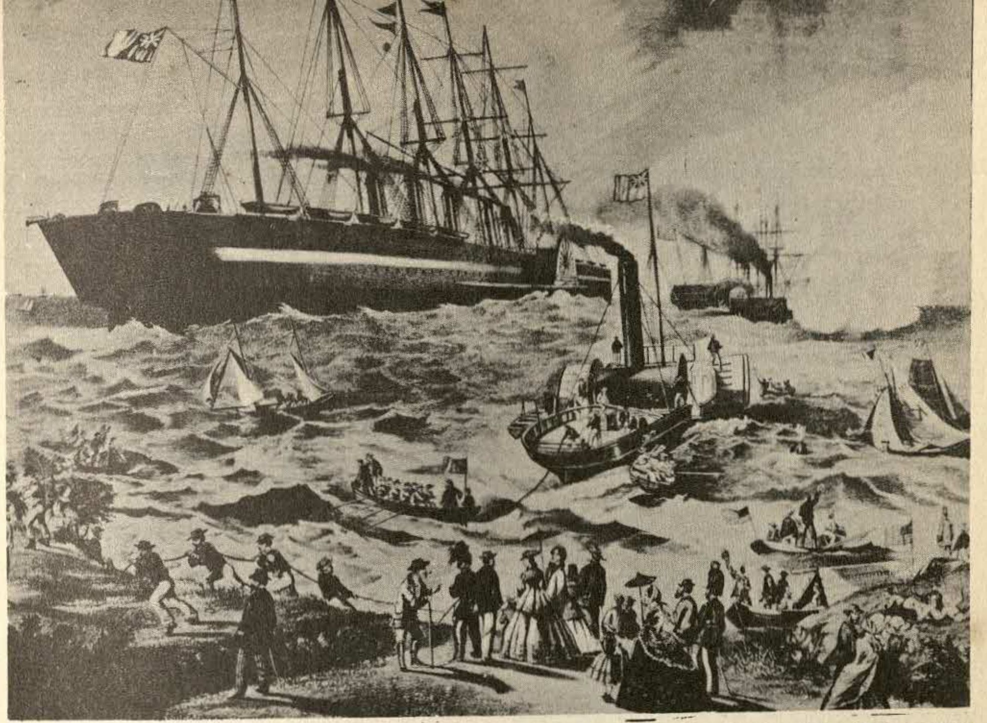
Courtesy Chattanooga Chamber of Commerce



Cable (*ḳā'b'l*), a very strong line consisting of three or more strands of wire or fiber. In nautical language, the word cable refers to a thick rope, or spring line, as distinguished from a smaller rope known as a hawser. Chains are now preferred to hempen cables on ships. Structural cables, made of twisted or straight wires, are used for suspension bridges; wire cables are also used as lines for derricks. An endless cable, operated by a stationary motor, is used to move a cable car. Electrical cable, employed to conduct electrical energy, is a waterproof insulated bundle of wires, usually wound around a core. For a further discussion of the uses of electrical cable, see *Cables.*

Cable, GEORGE WASHINGTON, novelist, born at New Orleans, La., Oct. 12, 1844; died at St. Petersburg, Fla., Jan. 31, 1925. He received a common school education and became a clerk in his native city. In 1863 he volunteered in the Confederate Army and served until the close of the war. Subsequently he studied civil engineering. About 1869 he began to write for the New Orleans *Picayune,* his contributions being mostly poems and humorous sketches. Later he became a contributor to *Scribner's Monthly.* His writings are particularly interesting for their authentic Creole dialect and for their attention to "local color." Cable became popular as a writer both in America and Europe, and gained distinction as a lecturer on social reform, in which he showed great interest. Among his best works are "Old Creole Days," "The Creoles of Louisiana," "The Silent South," "Dr. Sevier," "The Negro Question," "The Grandissimes," and "Strange True Stories of Louisiana."

Cable Cars (*ḳā'b'l ḳärz*), a class of vehicles used to carry passengers. They are propelled by an endless cable wire that makes a continuous circuit over pulleys, through a subterranean channel, by means of a stationary engine located at some point of the line where two loops of the cable meet. They have been replaced, except where excessively steep grades make them necessary, as in San Francisco, Cal. They are operated by a lever-manipulated grip by which the car may be



Courtesy Western Union Telegraph Co.

LAYING THE FIRST SUCCESSFUL TRANSATLANTIC CABLE

The large ship, the *Great Eastern,* shown at the shore of Trinity Bay, Newfoundland, in 1866, was the first large steamship built in Europe (at Millbank, England) and intended for service to Australia. Launched in 1859, the *Great Eastern* had a length of 680 ft. and a width of 83 ft. With accommodations for 5,000 passengers or a cargo capacity of 20,000 tons, the ship was ideally suited to carrying the 2,300 m. of submarine cable needed to link Europe and America by telegraph

set in motion or released at will. Because the operaation of the grip requires one man's full time and attention, they are inevitably two-man cars, which further increases their operating cost, so that today they are almost obsolete. The term is also used for cars attached to a cable moved by a revolving drum and operated by a person at a terminal point, on steep grades. Such lines are used in Pittsburgh, Pa., Los Angeles, Calif., and at Mt. Beacon, N.Y. Systems in which cars move along a suspended cable, drawn by another cable, are known as *aerial tramways*. Commonly used for transporting heavy raw materials, as ore and rock, they are in some places also used to carry passengers. Two well-known lines of this type ascend Sugarloaf Mt., at Rio de Janeiro, Brazil, and Cannon Mt., near Franconia, N.H. The *chair lift,* familiar at skiing and scenic resorts, is a modification of the aerial tramway.

Cables (*kā'b'lz*), lines used to carry electric power or communication. Power cables may be supported aerially on poles or towers, laid underground in trenches, or drawn through tile ducts. Telegraph and telephone cables laid in the ocean bed are called submarine cables. Electric cables, of either single-stranded conductor or multiple conductor types, usually contain dielectric insulation and some form of protective sheath or armor. The dielectric materials used are paper or pulp, rubber compounds, plastics, varnished fabrics, insulating oil, and weatherproofed braid. Sheathing is of lead, lead alloys, brass, aluminum, or galvanized steel tape or wire, overlaid with jute, asphalt, plastics, or varnished fabric. To exclude moisture, oil or gas may be introduced under pressure. Typical communication cable is paper-, pulp-, or plastic-insulated, in a lead or aluminum-plastic sheath. The number of pairs of conductors may be as many as 2,100, arranged in "quads" of four conductors twisted together in a pattern designed to prevent "crosstalk."

The coaxial cable, a modern development, usually contains eight copper tubes, each about the diameter of a fountain pen. Each pair of tubes can carry hundreds of telephone conversations as well as transmit television programs.

Transoceanic telegraph cables in most cases contain only one stranded conductor imbedded in gutta-percha, polymerized rubber, or polyethylene. Some of the newer cables are coaxial. Jute wrappings and steel wire armor layers are added for protection against chafing and to lend the cable strength to be lifted for repair. Throughout most of its length its over-all diameter is about one inch. The cable is electrically and mechanically tested before being coiled in the cable ship's tanks.

It is laid out overboard by machinery over seven-foot sheaves (resembling huge pulleys) located in the sterns of cable-laying ships and in the bows of repair ships. The laid cable lies in ooze on the sea bottom. Its ends are brought underground into cable stations, and it is there connected by wire with the offices where employees operate the cable with ordinary telegraph printing apparatus.

Lines of ocean telegraphic cable total about 390,000 statute miles, providing communication between all the leading cities of the world. There are also rapidly increasing mileages of telephone and television cable. At present, 19 telegraph cables cross the Atlantic Ocean; two cross the Pacific from Vancouver to Australia and New Zealand; and four interconnect North and South America. Constructed with modern electrical loading materials or fitted with ocean-bottom vacuum-tube amplifiers, their traffic capacity is such that from six to eight cablegrams pass simultaneously over a single cable, at a combined rate of from 300 to 400 messages an hour. Transmission speed (operating speed in letters or word per minute) varies widely, according to the type of cable in use.

One of the most important advances in the international communication field in many years has been the installation of deep-sea submerged amplifiers in cables of Western Union's transatlantic cable system. These amplifiers, inserted in cables on the ocean bottom, have increased the capacity of the company's transatlantic cables by more than 60,000,000 words annually; they have also created all-weather, maximum-security channels for government departments and for business and social use.

The first experiment with a cable was made by S. F. B. Morse (*q.v.*), of New York, in 1842, from Castle Garden to Governor's Island. Cyrus W. Field (*q.v.*) in 1854 organized a company with a capital of $1,750,000 to construct a cable across the Atlantic. This company began active work in 1857, but the effort was unsuccessful and resulted in the loss of 280 m. of cable. In the following year the first cable was completed from Heart's Content, on Trinity Bay, Newfoundland, to Valentia, Ireland. The first message, sent on Aug. 6, was: "England and America are united by telegraph; Glory to God in the highest; on earth peace, and good will toward men." After only some 400 messages had been sent, the cable failed to work. The next attempt, made in 1865. was also unsuccessful. In 1866, however, the steamer *Great Eastern* laid a permanently successful cable and thereafter repaired and finished the 1865 cable. The first message sent across the ocean on the 1866 cable was the news of a peace treaty between Prussia and Austria.

Cabochiens (*ḵȧ-bŏsh-yĕṉ'*), a faction, composed principally of small tradesmen, including many members of the butchers' guild, which caused disorders in Paris in 1413-14. The name is derived from one of the leaders, one Simon Lecoustellier, nicknamed *Caboche* (*i.e.,* a skinner of animals). Their riots, an economic protest against the influence of an aristocratic faction at court, resulted in extensive administrative reforms.

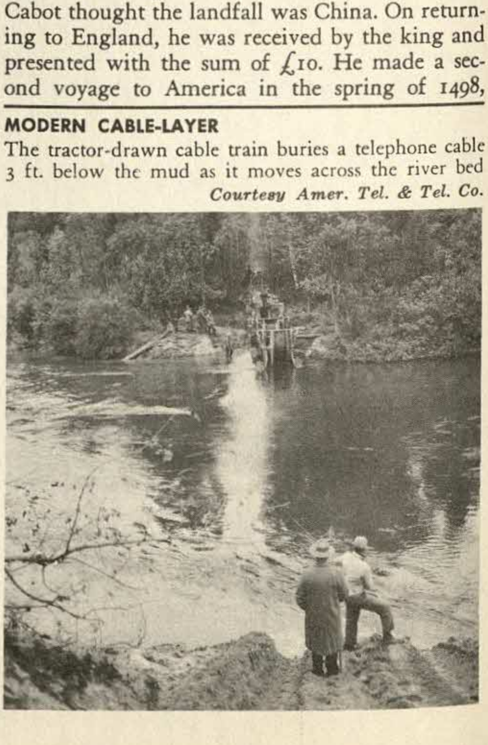
Cabot (*ḵăb'ŭt*), GEORGE, statesman, born in Salem, Mass., Dec. 16, 1752; died in Boston, April 18, 1823. After two years at Harvard Coll., he went to sea, some ten years later entering his family's shipping business. Interested in politics as early as 1778, he served as a member of the state convention which adopted the U.S. Constitution and as a U.S. Senator (1791-96), named on a Federalist party ticket. In 1814 he was chosen president of the Hartford Convention (*q.v.*), where he earnestly supported the Federalist principles of his long-time friend Alexander Hamilton (*q.v.*).

Cabot, JOHN (originally GIOVANNI CABOTO), founder of the British claims in North America, born probably in Genoa, Italy, in 1450; died in 1498. He went to live in Venice in 1461, becoming a citizen in 1476, and from there traded in the East until he settled in Bristol, England, *ca.* 1484. Under authority from King Henry VII, he sailed on a voyage of discovery in 1497; his son, Sebastian Cabot (*q.v.*), probably accompanied him. Discovering the North American coast, he is thought to have landed at what is now known as Cape Breton Island, Nova Scotia. Cabot thought the landfall was China. On returning to England, he was received by the king and presented with the sum of £10. He made a second voyage to America in the spring of 1498,

MODERN CABLE-LAYER

The tractor-drawn cable train buries a telephone cable 3 ft. below the mud as it moves across the river bed

Courtesy Amer. Tel. & Tel. Co.



reaching Greenland and Baffin Island and exploring the coast of North America as far south as the 38th parallel. Little is known, however, of his exploits in America, and he disappeared from history after the second voyage.

Cabot, SEBASTIAN, navigator, born in Venice (?), Italy, *ca.* 1476; died in 1557. He was a son of John Cabot (*q.v.*) and probably accompanied his father to America in 1497. Historical accounts have tended to confuse the exploits of father and son. The son is believed, however, to have made an attempt (1508-09), to discover the Northwest Passage, on which trip he may have entered what became known as Hudson Bay. In 1519 he was made grand pilot of Castile, Spain, but he gave up the post in 1526 to command four Spanish ships which set out from Sanlúcar de Barrameda for the Moluccas by way of the Strait of Magellan. Lacking sufficient provisions, he landed on the coast of Brazil and then sailed south. He discovered the Uruguay and Paraná rivers and explored the lower Paraguay. He returned to Spain in 1530 and was in the Spanish service until 1547, when he returned to England and settled there, receiving a pension from Edward VI. Cabot founded and headed the Merchant Adventurers, later known as the Muscovy Co. The company's purpose was to find a northeast passage to India and to open up trade with the East. It chartered an expedition to the White Sea which established a trade route to Russia. This, and other activities of the company, helped break the long-established trade monopoly held by the Hanseatic League (*q.v.*). A map of the world, published in 1544, is believed to have been the work of Cabot.

Courtesy Brown Bros., N. Y.

SEBASTIAN CABOT

Explorer of many regions of the world

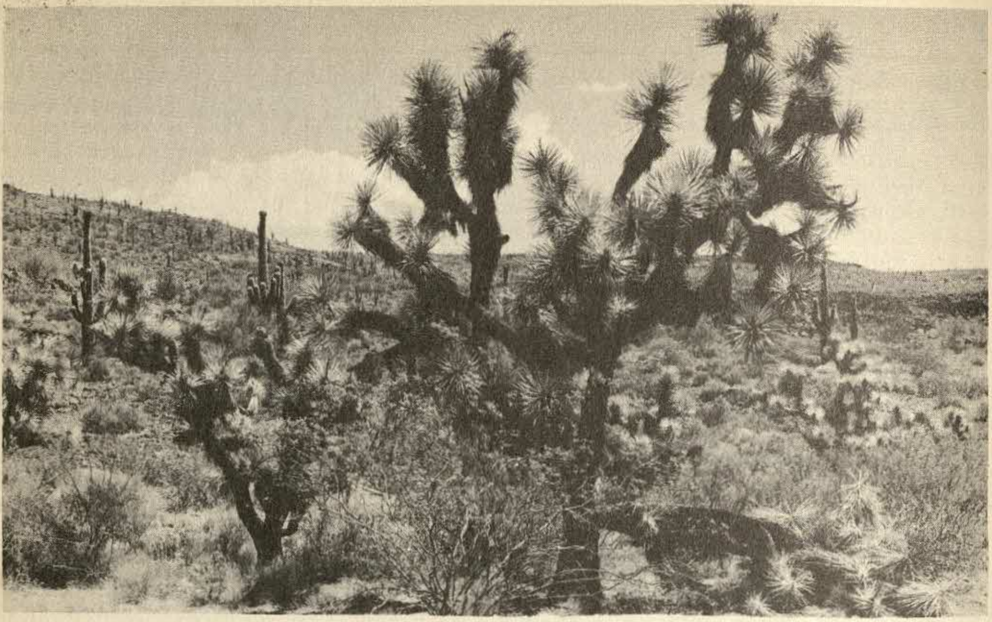
Cabral (*ka-bräl′*), PEDRO ALVARES, navigator, born in Portugal *ca.* 1460; died *ca.* 1526. He was commander of a fleet sent to the East Indies and set out to follow the route of Vasco da Gama (*q.v.*) by way of the Cape of Good Hope, but winds and strong equatorial currents carried his ships to the coast of Brazil. He took possession of the country in 1500 and named it Santa Cruz. Sailing eastward, he reached Madagascar and Mozambique. At Calicut, India, he aroused the natives by attempting to set up a post for trading and for converting the Mohammedans, and he was obliged to flee after bombarding the city. He sought his cargo elsewhere in the East Indies, and his ships returned to Portugal in 1501 heavily laden with merchandise. The claims of Portugal to territory in South America were based on the discoveries of Cabral.

Cabrini (*kä-brē′nē*), SAINT FRANCES XAVIER, (MOTHER MARIA FRANCESCA), humanitarian and founder of a Roman Catholic order, born in Sant' Angelo Lodigiano, Italy, July 15, 1850; died in Chicago, Ill., Dec. 22, 1917. Mother Cabrini founded the Missionary Sisters of the Sacred Heart of Jesus in Codogno, Italy, in 1880. She came to the U.S. in 1889 to establish the order here and founded more than 50 hospitals, orphanages, schools, and camps. The order was also established in South America, France, England, and Spain. In 1909 she became a U.S. citizen. She was beatified by Pope Pius XI in 1938 and canonized in 1946 by Pope Pius XII, who named her 1950) patron saint of emigrants. The first U.S. citizen to be canonized, she is buried at Mother Cabrini High School, New York City.

Cabul (*kä′bo͝ol*). See *Kabul.*

Cacao (*ka-kä′ō*), a small, wide-branching evergreen tree, 15 ft. to 40 ft. high, native to the American tropics, whose yellow and rose-colored flowers and fruits are borne directly on the trunk and main branches. Known as *Theobroma cacao,* it is a member of the tropical sterculia family. The seeds of the podlike fruit are the source of *cocoa butter,* used in cosmetics, perfumes, chocolate (*q.v.*), and medicine, as well as the beverage cocoa (*q.v.*). The trees are sensitive to drought and wind and are grown in the shade of larger trees. Cocoa was unknown in Europe before the voyage (1519) of Cortez, who found it to be the chief beverage of the Aztecs. Its stimulating effect is due to the alkaloid theobromine. World production of cocoa products is about 500,000 tons per year. The chief centers of production are Africa (Ghana, Nigeria, and St. Thomas) and Bahia, Brazil.

Cactus (*kăk′tŭs*), a genus of plants which are found mainly in the Western Hemisphere. About 1,000 species have been studied, but they



Courtesy National Park Service

JOSHUA TREE

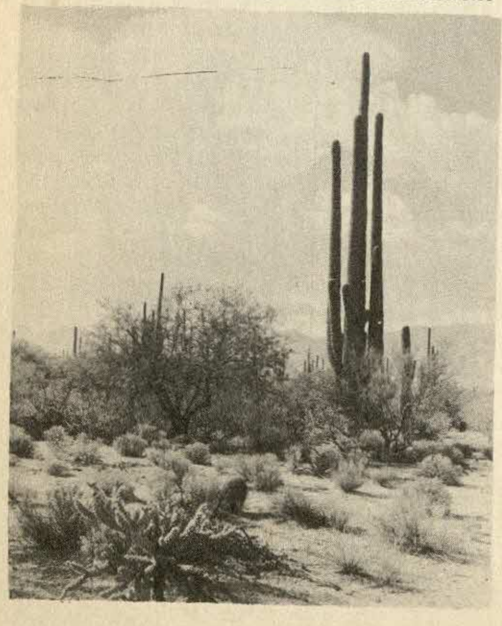
The flowers and buds of the Joshua (*Yucca brevifolia*), which is found in the Arizona desert, serve as Indian food

are distinctly American plants, except a few found in Africa. However, the prickly pear, a species of *Opuntia*, has been grown in Greece and Italy for many centuries. The *cacti* have large, succulent, and fleshy stems with a watery or milky juice of sweetish taste. They thrive best in arid districts, usually in sandy, rocky soil. In size they vary from very minute organisms to great trunks 30 ft. high. The structure of many species is complex. Some are inclosed with a tough and impermeable skin and covered by pricks and needles. Many species flower profusely, the blossoms opening at night and closing some time after sunrise. The prickly pear and other species are grown extensively as ornamental plants. Some species of the prickly pear bear an edible fruit known as Indian fig. The cardon forests of Mexico, which are confined to the basin of the Gulf of California, are dense and have extensive growths of a species of the *Cereus*. Similar plants are found in southwestern Texas, but the size diminishes gradually as we proceed north to Colorado and Nebraska. Some species possess medicinal properties. The stems of the larger varieties are used for fuel and fencing. See also color plates, *American Cacti I and II*, Volume V.

GIANT CACTUS OR SAGUARO

The Saguaro (*Carnegiea gigantea*), found in the Arizona desert, is one of the most massive of cacti, sometimes growing 50 ft. tall

Courtesy Soil Conservation Service



Caddice Fly (*kăd'dĭs*), or CADDIS FLY, a small insect which in many respects resembles the moth. The adult female lays its eggs in water, usually in the form of a double mass attached to the surface of some plant, and the larvae are submerged until they reach the pupa state. The larvae subsist mostly on vegetable forms, but also eat insects and the spawn of fish. About 150 species have been studied and classified. The adult insect has a hairy body and wings. In some species the body is covered with small scales and is supplied with four wings.

Cade (*ḳād*), JACK, an agitator of the 15th century, born of Irish parents. In 1450 he assumed the name of Mortimer and the title of captain of Kent. After gathering a following of 16,000 men, he marched to London and encamped on Blackheath. He was aggrieved at the action of certain counselors of King Henry VI and demanded, among other reforms, the dismissal of several officers. He defeated the royal troops that were sent against him, entered London, and executed two counselors. He held London about two days, until a promise of pardon dispersed his followers. No longer able to maintain his power, Cade fled, but he was mortally wounded by his pursuers.

Cadet (*ḳą-dĕt′*), a name formerly applied to the younger son of a nobleman to distinguish him from the elder. In France, the term is applied to any junior officer. In the U.S., it is applied to one enrolled in a military academy or school, as, for instance, at the U.S. Military Acad. at West Point or the U.S. Naval Acad. at Annapolis.

Cadillac (*ḳăd′′l-ăḳ*), a city in Michigan, seat of Wexford County, 95 m. N. of Grand Rapids, on the Ann Arbor and the Pennsylvania R.R.'s. It is situated on Lake Cadillac and Lake Mitchell and is a favorite summer resort. The surrounding country produces lumber, cereals, and potatoes. A Naval Armory is located here. The manufactures include rubber goods, motor boats, woodwork, road machinery, cement blocks, clothing, ventilators, thermostats, automobile equipment, and concrete pipe and culvert. The first settlement was made on the site in 1871, and Cadillac's incorporation dates from 1874. Population, 1930, 9,570; in 1950, 10,425.

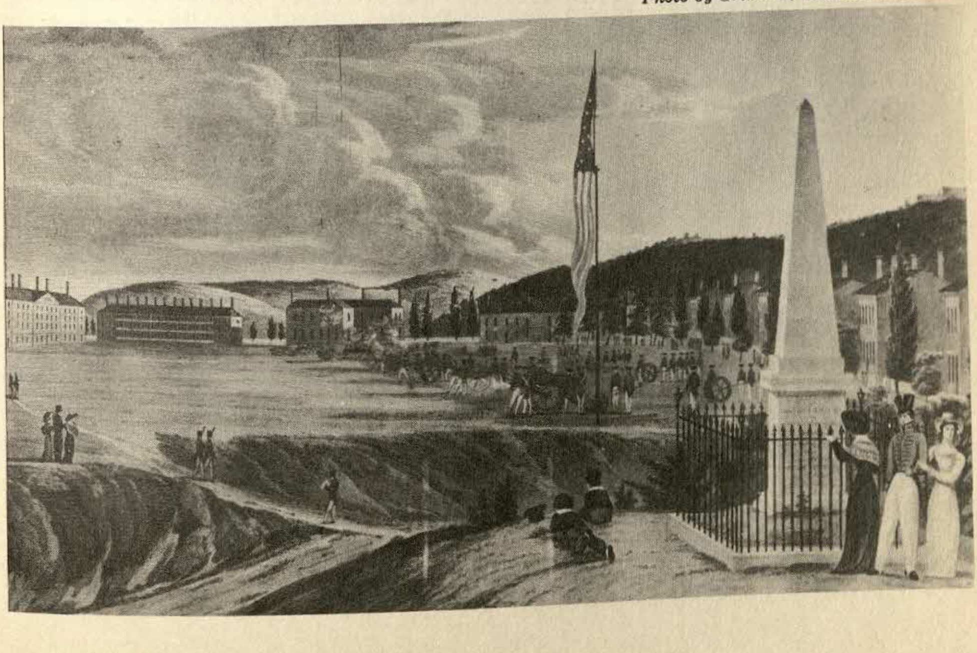
Cadillac (*ḳăd′′l-ăḳ*), SIEUR ANTOINE DE LA MOTHE, soldier, founder of Detroit, Mich., born in Gascony (a historic region of France), *ca.* 1656; died there, Oct. 18, 1730. Entering the army at an early age, he became a lieutenant in 1677. In 1683 he came to America and settled at Port (now Annapolis) Royal, N.S. He gained the confidence of the Comte de Frontenac (*q.v.*), who put him in command of the French post at Mackinac in 1694. Obtaining a grant to the site of Detroit, he went there in 1701. He worked hard to expand the power of France in the region and to make Detroit "the Paris of New France." He was appointed governor of the new colony of Louisiana, where he arrived in 1713. He allegedly enriched himself in this position. Recalled to Paris in 1716, he was imprisoned for a time, but was released in 1717. Thereafter he lived in retirement.

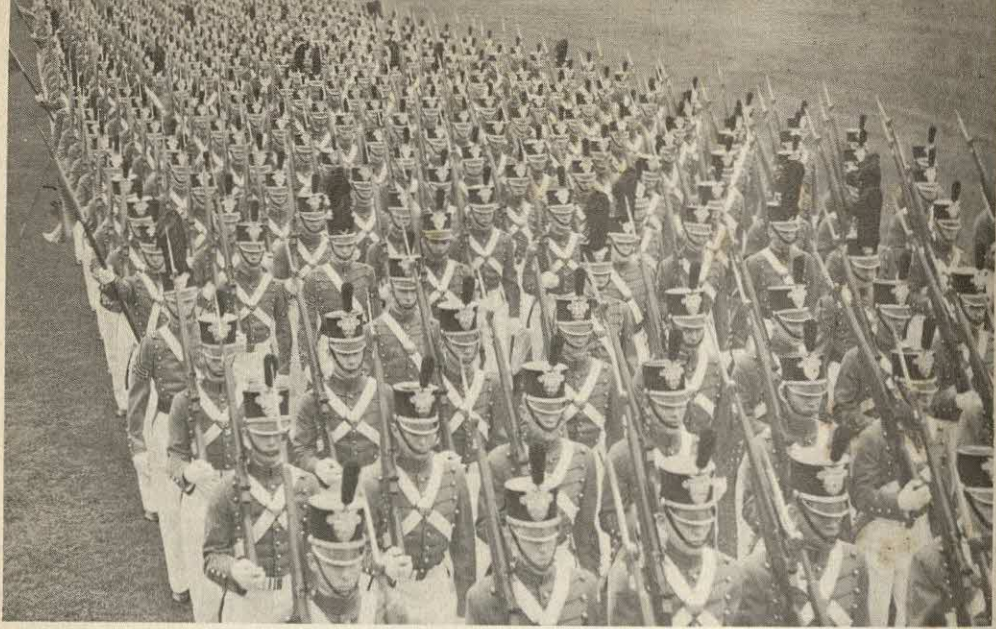
Cádiz (*ḳą-dĭz*), a seaport city in Spain, capital of the province of the same name (area, 2,834 sq. m.; pop., *ca.* 600,000). It is located on the Bay of Cádiz, 58 m. N.W. of Gibraltar. It is an important naval base and overseas shipping center. Its primary industries are the canning of fish, ship repair and building, and the manufacture of tobacco products. The seat of an archbishop, it has two cathedrals; there are also buildings from the 16th and 17th centuries and the faculty of medicine of the Univ. of Sevilla.

Cádiz was founded about 1100 B.C. by the Phoenicians, who named it Gadir, and it was long

WEST POINT CADETS, 19TH CENTURY

Photo by Grimaldi, courtesy West Point





Signal Corps Photo

WEST POINT CADETS, 20TH CENTURY

one of the chief commercial cities of Europe. It was conquered successively by the Carthaginians, Romans, Goths, Moors, and Spaniards. The English occupied it in 1596, and in 1810 and in 1823 it was held by the French. Its greatest prosperity was reached when Spanish-America was in its most prosperous state. With the independence of the South American republics, and the loss of territory in Central America, it began to decline gradually. Part of the city was destroyed in 1947 by a munitions factory explosion. Population, *ca.* 75,000.

Cadman (*kăd′man*), CHARLES WAKEFIELD, composer, born at Johnstown, Pa., in 1881. He made phonograph recordings of American Indian songs and accompanied by Princess Tsianina Redfeather, Indian mezzo-soprano, played the selections in London and Paris and in many cities of the U.S. His operas include: "Shanewis" (1918); "The Garden of Mystery" (1925); "The Witch of Salem" (1926); "The Sunset Trail" (1927). He has also written much incidental music for films, pieces for the piano, and song cycles. Died in 1946.

Cadmium (*kăd′mĭ-ŭm*), a metal found in zinc ores and rarely as a sulphide, of which greenockite is an example. It is allied closely to zinc. The metal was discovered in 1818 while testing for arsenic in zinc wastes. In color it is white, or has a slight bluish cast. It has a high luster when polished and is harder than tin. The salts of cadmium are serviceable in medicine. Cadmium sulphide is a powder with a lemon-yellow color of great permanency. It is used in coloring soap and in making a pigment known as *cadmium yellow*.

Cadmus (*kăd′mŭs*), in mythology, the son of Agenor, King of Phoenicia, and the brother of Europa. It is related that Jupiter carried Europa to a distant land and Cadmus was sent in search of her. He inquired of the Delphic oracle as to where he might find her, and was advised to follow a cow which would meet him, but was told that he would be unable to discover the whereabouts of his sister. At the spot where the cow would lie down he was to found a city. He followed her into Boeotia, and on the place where she lay down he built a city and named it Cadmea, afterward changed to Thebes. He slew a dragon which guarded the well sacred to Mars and was directed by Minerva to sow the teeth of the monster, which immediately sprang up as a host of armed men. These men turned upon Cadmus and fought among each other until all but five were slain, and those remaining joined Cadmus in enlarging the new city. He was honored by receiving Harmonia, daughter of Mars and Venus, as his wife, and became the inventor of many useful devices.

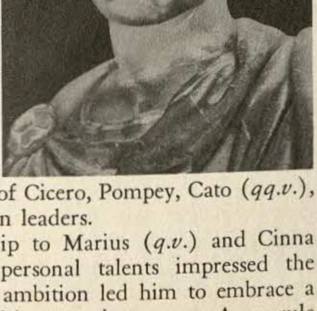
Caedmon (*kăd′mŭn*), the earliest Anglo-Saxon poet and writer who wrote in his own language. The time of his birth is unknown, but the year 680 has been assigned as the probable year of his death. He was a tenant or cowherd at Whitby, on the abbey lands. Owing to his skill in forming rhymes, he was placed in a monastery, and afterward became a monk. His life was spent in composing on religious subjects and Bible history. Some of his writings are still preserved. They bear a striking resemblance to "Paradise Lost," and doubtless influenced the great genius of Milton.

Caen (*kän*), a city of France, capital of the department of Calvados, 148 m. N.W. of Paris. It is on the Orne River, about 9 m. from its entrance into the English Channel. It is in the center of a fertile plain. Several railroads and a maritime canal serve the city. Manufactures include lace, cotton textiles, cutlery, clothing, and liquors. Angora rabbits, raised commercially in the vicinity, provide skins for glovemaking. Caen is rich in medieval and earlier structures, including L'Abbaye-aux-Dames and L'Abbaye-aux-Hommes (both from the time of William the Conqueror) and a university founded in 1431. Caen was ruled by England in 1346 and 1417-50. Strategically located, it was often a battle site, most recently in World War II, when it was taken by the Allies on July 9, 1944. Population, 1954, 67,851.

Caesar (*sē'zẽr*), the family name of the descendants of Iulus, one of the legendary founders of the Roman state. The early emperors—Octavianus (adopted son of Julius Caesar, *q.v.*, later called Augustus, *q.v.*), Tiberius, Caligula, Claudius, and Nero—used the name to show their relationship to the famous empire builder. Later emperors, beginning with Vespasian (A.D. 69), retained it as a title equivalent to emperor, and as such it survived into modern times as czar (*q.v.*) or tsar in Russia and as kaiser (*q.v.*) in Germany and Austria.

Caesar, AUGUSTUS. See *Augustus.*

Caesar, GAIUS JULIUS, Roman statesman, general, and historian, born July 12, 100 (or 102) B.C.; died March 15, 44 B.C. The descendant of a Roman patrician family, he leaned, however, to the popular party. His first wife was Cornelia, daughter of Cinna, one of the principal enemies of Sulla (*q.v.*), whose wrath forced Caesar to flee Rome until Sulla's death in 78 B.C. He then passed rapidly through the various grades of civil and military office and rose to influence as a contemporary of Cicero, Pompey, Cato (*qq.v.*), and other Roman leaders.



JULIUS CAESAR

His relationship to Marius (*q.v.*) and Cinna and his great personal talents impressed the masses, and his ambition led him to embrace a policy of opposition to the senate. As curule aedile for the year 65, he extended his popularity by lavishing vast sums of money on public buildings and public games. In 63 Caesar made his first decisive appearance as a politician, when, in his speech to the senate, he urged leniency for Catiline (*q.v.*) and his coconspirators; it should be noted, however, that the senate was steadily losing its popularity. In the same year he was elected pontifex maximus and praetor (for the year 62). He spent the year 61 as propraetor in Farther Spain, where he gained experience in provincial administration as well as an immense booty from wars with native tribes. This enabled him to reduce his enormous debts.

Returning to Rome in 60, he was elected consul despite the opposition of the senatorial "old guard" headed by Cato. He had the support of Pompey and of Crassus (*q.v.*), an ambitious plutocrat. This combination of the three most influential men in Rome is commonly known as the *First Triumvirate,* although it had no official standing. As consul in 59, Caesar drove through an extensive legislative program, including a popular agrarian law. He obtained prestige and financial concessions for Pompey and Crassus; for himself he obtained a military command and the proconsulship (governorship) of Cisalpine and Transalpine Gaul for the unprecedented term of five years.

In 58 he left Rome for his province and spent the following years, until 49, in a series of brilliant campaigns—the Gallic Wars—which produced the total subjugation of Gaul (practically coextensive with modern France) and the extension of Roman power to the Rhine on the east and to the English Channel on the north. In the summer of 58 he defeated the Helvetii and drove back over the Rhine a German horde under Ariovistus. In 57 he subjugated the Belgic tribes after a desperate battle with the warlike Nervii. In 56 he subdued the Veneti, a maritime people on the Bay of Biscay, while his lieutenant, Crassus (son of the triumvir), conquered the tribes in Aquitania (modern Gascony). In 55, having built his famous bridge across the Rhine, he terrorized the wild Germanic tribes, largely to convince them that Gaul was now completely Roman. In the same year he became the first Roman general to visit Britain, and in the next year he marched inland as far as the Thames but made no attempt to set up a permanent garrison. In 54-52 rebellions among the conquered Gauls nearly ended Caesar's career, but the defeat of their leader Vercingetorix (*q.v.*) effectively ended all serious opposition to Roman rule.

Caesar's Gallic command, originally granted for five years, had been renewed for a second five-year term, to expire in the spring of 49. He wanted to stay with his army in Gaul through the summer of 49 and run for a second consulship, but he did not want to return to Rome as a private citizen for fear of prosecution by the senate for his conduct in his first consulship of 59. Fear and jealousy of Caesar had been growing in Rome, however, and Pompey was afraid that Caesar's military and political influence was exceeding his own. Negotiations for peaceful compromise failed, and the senate voted that Caesar must lay down his command and return to Rome. Caesar's reply was to cross the Rubicon (*q.v.*) and march on Rome (January 49). This action began the great civil war in which Caesar overthrew the senatorial government and made himself master of the Mediterranean world.

The initial march into Italy was spectacularly successful; Pompey and most of the senators fled to Greece to gain time. After securing Italy and the capital, Caesar hastened to Spain and defeated the Pompeian legions there. Assuming dictatorial powers temporarily, he was elected consul for 48, and in the fall of 49 he crossed the Adriatic despite Pompey's naval superiority. In the spring of 48 he besieged Pompey at Dyrrhachium, finally destroying his army at the battle of Pharsalia, or Pharsalus (Aug. 9, 48). Pompey fled to Egypt but was murdered on the beach as he disembarked. Caesar, in pursuit, soon reached Alexandria. For some months he was pinned down by a struggle with the Alexandrians, after he had placed the famous Cleopatra (*q.v.*), then about 22 years old, on the Egyptian throne. In the summer of 47 he defeated Pharnaces II, a friend of Pompey, in a lightning campaign at Zela, which he described in his own terse summary: *"Veni, vidi, vici"* ("I came, I saw, I conquered"). In 46 he crushed senatorial forces at the battle of Thapsus, in North Africa; Cato committed suicide at Utica as a final gesture of defiance.

After defeating Pompey's sons at Munda, Spain, in 45, Caesar was made dictator for life, Roman coins were stamped with his portrait, and the month Quintilis was renamed Julius. He enlarged the harbor of Ostia, planned other engineering projects, such as the draining of the Pontine marshes and making a canal through the Isthmus of Corinth, and, on the advice of mathematicians and astronomers, reformed the calendar (*q.v.*).

His refusal of the crown offered him at the feast of the Lupercalia (Feb. 15, 44) did not appease the aristocratic faction, and he was stabbed by a clique of treacherous friends at Pompey's Theater on the Ides of March, 44. The presence among the assassins of his friend Brutus (*q.v.*), whose fortunes he had done much to advance, evoked, according to tradition, Caesar's last words, "Thou too, my child?"—the *"Et tu, Brute!"* of Shakespeare's play.

His fame and exploits as statesman, orator, and general are extraordinary, and there is no doubt that Caesar left an indelible mark on the Western world. Of his histories—all written in masterful Latin and historically valid—only *"De Bello Gallico"* and *"De Bello Civili,"* commentaries on the Gallic and civil wars, are extant.

Caesarea (*sē-zạ-rē′ạ*), the name of several ancient cities, among them the capital of Cappadocia in Asia Minor, Caesarea Philippi (*q.v.*), and Caesarea Palestinae. The last-named, built (*ca.* 25-13 B.C.) by Herod the Great, was named for Caesar Augustus. It is frequently mentioned in the Bible (Acts), and St. Paul was held here. Some 30 m. N. of Jaffa, it survives as a fishing village called Qisarya.

Caesarea Philippi (*sē-zạ-rē′ạ fị-lĭp′ī*), an ancient town in Palestine, *ca.* 40 m. N. of the Sea of Galilee, founded *ca.* 3 B.C. by Philip, son of Herod the Great. It is mentioned in Matthew 16:13, and it was here that Jesus disclosed his earthly mission to his disciples (Mark 8:27). It was briefly renamed Neronias in honor of Nero. The site is now occupied by a small village called Baniyas.

Caesarean Birth (*sē-zâr′ē-ạn*) or CAESAREAN SECTION. See *Birth*.

Caffeine (*kăf′ē-ĭn*), the stimulant substance of coffee, tea, kola nuts, and cocoa. The taste is bitter. Caffeine crystallizes in white silky needles and forms double salts with platinum and gold chlorides. It is a methyl substitution compound of theobromine and is used in medicine as a stimulant and a diuretic. The caffeine content of coffee is from one to four per cent; of tea, from two to four per cent.

Cagliari (*käl′yä-rē*), a city in Sardinia, capital of a province of the same name (area, 3,590 sq. m.; pop., *ca.* 500,000), situated at the southern end of the island on the Gulf of Cagliari. Railway lines connect it with major points in Sardinia, and shipping lines join it to the Italian mainland. Industrial products include boats, cotton fabrics, bricks, and ceramics. Among trade goods are flax, grain, wine, coal, and salt from nearby lagoons. The city is said to have been founded by the Phoenicians, and its ancient name was Caralis. Its cathedral dates from 1312 and its university from *ca.* 1600. Population, city and commune (1951), 142,744.

Cagliari, PAOLO. See *Veronese, Paolo.*

Cagliostro (*käl-yôs′trô*), "COUNT" ALESSANDRO, adventurer, born (as GIUSEPPE BALSAMO) in Palermo, Sicily, June 8, 1743; died near Urbino, Italy, Aug. 26, 1795. He studied chemistry and medicine in a monastery and later he traveled widely through most of the countries of Europe as a physician and alchemist. His practice consisted largely of prescribing his "elixir of immortal youth." For some years he lived in Warsaw, where he grew rich and lived in an ostentatious style. In 1785 he became implicated in the affair of the Diamond Necklace (*q.v.*) and was jailed for about a year. Later arrested in Rome on a charge of Freemasonry, he was imprisoned for life in the fortress of San Leone near Urbino.

Cahokia (*ḳạ-hō′ḳĭ-ạ*), a village in southwestern Illinois, below East St. Louis on the Mississippi River. Named for a tribe of Illinois Indians, the village was founded by French missionaries in 1699 and was the first permanent settlement in Illinois. American troops took it from the British in 1778. Cahokia was incorporated in 1927. Near by may be found the Cahokia Mounds, probably constructed by mound builders (*q.v.*) of the period 1300-1700. Population, 1950, 794.

Cahors (*ḳä-ôr′*), a city of France, capital of the department of Lot, 59 m. N. of Toulouse. It is situated on a rocky peninsula formed by the Lot River. Cahors dates back to pre-Roman times and in the Middle Ages was an important financial center. The Romanesque-Byzantine Cathedral of St.-Étienne was completed in the 12th and 13th centuries, and many other historically interesting buildings may be found in the older sections of the city. Cahors manufactures textiles and glass and trades in agricultural products such as wine, tobacco, and nuts. Population, 1948, 15,445.

Caiaphas (*ḳā′yạ-fạs*), JOSEPH, in the New Testament, the Jewish high priest who presided at the trial of Jesus (Matthew 26:57). He had no power to condemn Jesus, however, this being left to the Roman authorities. Caiaphas later participated in the examination of Peter and John.

Caicos (*ḳā′ḳŭs*), a group of British islands of the Bahama chain. See *Turks and Caicos Islands.*

Caillaux (*ḳȧ-yō′*), JOSEPH, politician, born in Le Mans, France, March 30, 1863; died there, Nov. 21, 1944. Caillaux was first elected to the chamber of deputies in 1898. Perhaps most important was his work as finance minister (1899-1902, 1906-09, 1911-12, 1914, 1925-26, 1935) and his successful introduction of the income tax into France against strong opposition. As premier (1911-12), he handled with great skill the negotiations with Germany over the Agadir (*q.v.*) incident. His strong personal convictions and high intelligence aroused much political rivalry. He was tried and convicted (1920) of treason, allegedly committed while on a mission to South America during World War I. Sentenced to prison and to subsequent banishment and deprivation of his civil rights, he was granted an amnesty in 1924. He served again as finance minister in the Painlevé (1925) and Briand (1926) governments and was then elected to the senate, in which he served until the fall of France in World War II. In 1935 he was finance minister in the brief Bouisson government.

Cain (*ḳān*), the eldest son of Adam and Eve. In Genesis 4:2 he is spoken of as a cultivator of the soil. Because his sacrifices were less acceptable to God than those of his brother Abel, Cain slew Abel and became a fugitive and vagabond. He built the city of Enoch in the land of Nod.

Cain, JAMES M., writer, born in Annapolis, Md., July 1, 1892. He received his A.B. degree from Washington Coll., Md. After service in World War I, he was a newspaperman and editorial writer, later concentrating on magazine and film writing. Cain's themes usually concern family morality and crime, and the story action often features violence. Frequently dramatized or filmed, his books include "The Postman Always Rings Twice" (1934), "Double Indemnity" (1936), "Serenade" (1937), "Mildred Pierce" (1941), and "Galatea" (1953).

Caine (*ḳān*), THOMAS HENRY HALL, novelist, born at Runcorn, England, May 14, 1853; died on the Isle of Man, Aug. 31, 1931. He attended schools on the Isle of Man and in Liverpool and studied architecture. Caine became a journalist on the Liverpool *Mercury* and, in 1881, went to London, where he wrote many novels. Some of these were adapted for the stage. He lived for a short time with Dante G. Rossetti (*q.v.*). He traveled extensively, visiting Canada and the U.S. in 1895. Some of his books are "Recollections of Rossetti," "The Eternal City," and several books on life on the Isle of Man.

Caird (*ḳârd*), EDWARD, philosopher and theologian, born in Greenock, Scotland, March 22, 1835; died in Oxford, England, Nov. 1, 1908. He studied at the Univs. of Glasgow and Oxford and in 1866 became professor of moral philosophy at the Univ. of Glasgow. In 1893 he was made master of Balliol Coll., Oxford. Founder of the neo-Hegelian school of British philosophy, Caird published works on Kant and Comte (*qq.v.*) and "An Introduction to the Philosophy of Religion" (1880).

Cairn (*ḳârn*), a name given to a heap of stones placed on a grave or built up as a landmark. Cairns are quite numerous in many places in America, especially on the plains, where they are found on hills, usually marking a group of graves. In Europe the Druids and other primitive peoples built cairns over their graves and, like the American Indians, placed rude weapons, such as stone axes and arrowheads, with the dead bodies. Cairns may be found in many parts of Scotland, Ireland, and Wales. The most remarkable one is near Drogheda, on the Boyne River, in the form of a mound nearly 80 ft. high. See *Barrow; Mound Builders.*

Cairngorm (*ḳârn′gôrm*), a range of mountains in northeast central Scotland, part of the Grampians (*q.v.*). They are located between the Dee and upper Spey rivers, near the junction of the boundaries of Aberdeenshire, Banffshire, and Inverness-shire. The major peaks include Cairn Gorm (4,084 ft.), Cairn Toul (4,241 ft.), Ben Macdhui (4,296 ft.), and Braeriach (4,248 ft.). The name cairngorm is also applied to a quartz mineral—yellow and brown—found in the mountains.

Cairo (*kā′rō*), county seat of Alexander County, Illinois, at the junction of the Mississippi and Ohio Rivers, on the Illinois Central, the Gulf, Mobile & Ohio, and other railroads. Located on a low tract of land which was once periodically flooded, the city is now protected by levees. A U.S. marine hospital is situated in the vicinity. Cairo's trade centers in grain, coal, and lumber; its principal industries include furniture factories, lumber mills, and cotton oil mills. First settled in 1846, Cairo was incorporated in 1857. Charles Dickens described the city as *Eden* in his "Martin Chuzzlewit." Population, 1950, 12,123.

Courtesy British Information Services, N. Y

CAIRO UNIVERSITY AT GIZA, NEAR CAIRO

Cairo (*kī′rō*), the capital of modern Egypt and the largest city in Africa, located on the Nile River, about 10 m. above the delta. A number of railroad lines connect Cairo with Alexandria, Aswan, the Delta towns, and the Suez Canal. River navigation and international air traffic are also important in maintaining the city's commerce.

Cairo is the seat of the university mosque of Al Azhar, a center of Islamic learning founded in 970, and of other universities, including Cairo (1908) and Heliopolis (1950). Under European influence a public school system was initiated, and many office buildings and residences were erected during the 19th century.

Cairo's buildings include some of the finest remains of Arabian architecture, among them some 300 mosques, a few of which were built as early as the ninth century (see also *Mosque*). In the section of the city called Old Cairo is the citadel of Saladin (*q.v.*), built about 1177, within which is Joseph's Well, cut 270 ft. into the rock. The great pyramids and sphinx (*qq.v.*) are near by at Giza (El Gizeh), about 10 m. from the city, and the 15th-century tombs of the mamelukes (*q.v.*) lie just outside the city. Noted museums of Egyptian and Islamic antiquities are located in the city.

NEW DESIGN IN CAIRO

Modern apartment houses are radically changing the face of Cairo, Egypt, one of the world's most ancient cities.

Near modern Cairo (Al Kahira or al-Qâhirah, "the victorious," in Arabic) are the sites of ancient Memphis and Heliopolis, and of the Roman for-

STREET SCENE IN OLD CAIRO

Courtesy Brown Bros., N. Y.

CAISSON CARRYING THE EARTHLY REMAINS OF PRESIDENT F. D. ROOSEVELT

tress-town of Babylon, which was seized when the Arabs conquered Egypt in 641. The Arabs built the town of al-Fustât, near Babylon, which later became known as Old Cairo. Added to this section was Cairo proper, built by the Islamic dynasty of the Fatimids in 968. Cairo was the Egyptian capital from the latter part of the tenth century until 1517, when Egypt was occupied by the Ottoman Turks. The French conquest of Egypt and their occupation of Cairo (1798-1801) marked the beginning of European influence in the city. Later in the 19th century Mohammed Ali founded the recent ruling house and again made Cairo the nation's capital. The British occupied the city from 1882 until 1922, withdrawing the last of their forces in 1936. During the African campaign in World War II, Cairo was the seat of British army headquarters. President F. D. Roosevelt, Winston Churchill, British prime minister, and Chiang Kai-shek, generalissimo of China, met here (November 1943) to decide the fate of Japan after the conclusion of the war in the Pacific. In 1952, during anti-British demonstrations, some of the 19th-century landmarks, including the famous Shepheard's Hotel, were destroyed by fire. Population, *ca.* 2,000,000.

Cairo Conference. See *Cairo* (Egypt).

Caisson (*ḳā'sŭn*), a word used in several professions to designate types of enclosures, cases, or chambers. In its military sense, the word refers to a box that holds ammunition or to an ammunition wagon. In architecture, a caisson is a sunken panel in a ceiling, vault, or soffit. In engineering, the term applies to a frame or case sunk into a river bed to keep out water during construction work on piers or bridges. The term also applies to a boat gate for closing the entrance to a dry dock.

Caisson Disease (*ḳā'sŭn dĭ-zēz'*), in medicine, a disease peculiar to divers and tunnel workers caused by working under increased air pressure. See also *Aeroneurosis; Occupational Diseases.*

Cajamarca (*ḳä-hä-mär'ḳä*), city and department of northern Peru. The city, located on the eastern slope of the Andes (9,022 ft. above sea level), *ca.* 370 m. N. of Lima, produces straw hats, textiles, and leather goods. It was the site of Pizarro's capture and murder of Atahualpa (*q.v.*), the last Inca ruler. Population, *ca.* 16,000.

Cajeput Tree (*ḳăj'ę-pŭt*), or CAJUPUT, a tree known botanically as *Melaleuca leucadendra,* in the myrtle family; it is also called swamp tea-tree or white tea-tree. It is native to Australia, southeastern Asia, and the East Indies. The tree grows to 80 ft. in height. It has creamy-white flowers, in spikes up to 6 in. long, which resemble bottle brushes. The thick, spongy bark, almost impervious to water, is used for roofs and boats; the hard, close-grained wood, extremely durable underground, resists termites and is used for posts and wharf piles. The long narrow leaves contain a green, volatile, inflammable, aromatic oil, which is distilled for medicinal uses. Cajuput oil is an almost universal remedy in the Orient, but it is not recognized by the U.S. Pharmacopoeia.

Cajetan (*ḳăj'ē-tăn*). See *Vio, Giacomo de.*

Calabar Bean (*ḳăl'ȧ-bär*), the seeds of an African plant, *Physostigma venenosum.* The bean is the source of an alkaloid, physostigmine, which is a violent poison. Physostigmine salicylate is used therapeutically as an agent to contract the pupil of the eye in glaucoma (an eye disease) and to shorten the effect of drugs used to dilate the pupil. The drug has been used for the relief of painful muscular spasms in rheumatoid arthritis, fibrositis, and bursitis.

Calabash Tree (*ḳăl'ȧ-băsh*), a tree known botanically as *Crescentia cujete,* in the bigonia family. It is wild, but often cultivated in the West Indies and tropical America. The tree grows to about 20 to 40 ft. tall; has large, horizontally spreading branches, with long leaves in clusters at intervals; and large, tubular, drooping flowers, yellowish with purple markings. The fruit, also called calabash, grows from a few in. to 1½ ft. in diameter; it is normally globular, but can be shaped as desired if carefully tied while still young. The smooth shells of the fruit resemble gourds and may be carved to make ornaments and various domestic utensils. The wood is light, flexible, and tough. The word *calabash* is also applied to the hard-shelled fruit of a tender vine (*Lagenaria*) native to the Old World tropics and belonging to the gourd family. The fruits are of various shapes and up to 3 ft. long.

Calabria (*ḳȧ-lä'brĭ-ȧ*), the name given in Roman times to the southeastern peninsula of Italy. This district, included within the Calabria of the Romans, corresponded nearly to the modern province of Lecce. On the other hand, the modern Calabria is nearly co-extensive with the ancient Bruttium. It includes the three provinces of Catanzaro, Cosenza, and Reggio di Calabria. This region is enclosed by the sea on all sides, except the north. It is separated from Sicily by the Strait of Messina and is traversed by highlands which reach an altitude of nearly 4,000 ft. The area is 5,819 sq. m. Rice, grain, hemp, flax, fruit, and live stock are the chief products. It has mineral deposits of value, such as rock salt, marble, alum, gypsum, alabaster, and copper. Population, *ca.* 1,500,000.

Calais (*ķăl'ĭs*), a city and seaport of Washington County, Maine, on the St. Croix River, 12 m. from Passamaquoddy Bay. It has transportation facilities by the St. Croix & Penobscot and the Canadian Pacific R.R.'s and is the trading center for the area. It is also a tourist center in summer. Navigation on the St. Croix River is open the greater part of the year, and Calais is a port of entry. Manufactures include canned blueberries and lumber products. Calais was first settled by lumbermen in 1778 and incorporated in 1851. It lies opposite St. Stephen, N. Br. Population, 1930, 5,470; in 1940, 5,161; in 1950, 4,589.

Calais (*ķăl'ā*), a fortified seaport city of France, on the Strait of Dover, in the department of Pas-de-Calais, 150 m. N. of Paris. The harbor is deep and has a lighthouse 190 ft. high. Among the chief buildings are the Church of Notre Dame, the public library, and the Hôtel de Guise. It has an important commerce in eggs, wine, grain, vegetables, fruits, and other products of the farm and garden. The chief manufactures include cotton, silk, and woolen goods, laces, gloves, fabrics, and machinery. Edward III of England laid siege to it in 1347 for 12 months, and the latter country held it until 1558, when it was retaken by the Duke of Guise. It was strongly defended by the English and French in World War I. In World War II, British and French troops, in four days of street fighting, May 1940, held off the German army while the evacuation of Dunkirk (*q.v.*) took place. The Allies retook it, Sept. 30, 1944. Population, *ca.* 75,000.

Calamander Wood (*ķăl'ȧ-măn-dẽr*), a kind of wood used extensively in making furniture, obtained from a tree similar to the ebony and persimmon trees. It resembles rosewood, takes a fine polish, and exhibits a variety of colors. This wood is so hard that it can be worked only with the best edged tools and is preferred to most varieties as a veneer. The supply is secured largely from Ceylon and southern India.

Calamianes (*ķä-lä-myän'ĕs*), a group of islands belonging to the Philippines, between Palawan and Mindoro, from which it is separated by Mindoro Strait. The surface is hilly, but fruits, tobacco, rice, and sugar-cane are produced profitably. Gold and iron deposits abound, but they are not worked to any great extent. The area is 340 sq. m. Population, 20,000.

Calamine (*ķăl'ȧ-mīn*), a mineral consisting essentially of zinc. The two species were formerly known as carbonate and silicate, but the former is now classed as *smithsonite* and the latter as *calamine*. Pure calamine contains 52 per cent of zinc and is valuable as an ore of that metal. It is found in America and Europe, occurring mostly in small crystals.

Calamus (*ķăl'ȧ-mŭs*), the name commonly applied to a genus of palms from which rattan canes are made for caning chairs. These trees hold a place midway between the grasses and the larger palms. They yield material useful in the construction of cables and bridges. The term is also used to designate the aromatic *sweet flag* that is native to the swamps and ponds of Temperate Zones, which yields essential oils used in perfumes, and to sweet-scented grasses of India valuable in the manufacture of incense.

Calash (*ķȧ-lăsh'*), or CALÉCHE, a carriage with low wheels, fitted with a top or hood, and furnished with seats for four inside. The driver occupies a seat in the front. Some are constructed with a movable front, making it possible to use the vehicle either as an open or a closed carriage. The name is applied in Quebec to a cart or carriage with two wheels, fitted with a seat for two passengers, and a single seat for the driver on the dashboard.

Calcite (*ķăl'sīt*), the carbonate of lime, distinguished from aragonite in that it crystallizes in the hexagonal system. It is a general term used to describe a variety of minerals, such as marble, chalk, and limestone. The colors are usually white or pale shades of gray, but include violet, green, yellow, blue, and red, owing chiefly to the presence of impurities. Iceland spar is a colorless variety found in the basalt rocks in Iceland. Calcite ranks second in the scale of hardness.

Calcium (*ķăl'sĭ-ŭm*), the metal forming the base of lime. Combined with other substances, it is one of the most widely distributed and abundant, but is rarely found in the native state. It was first obtained in the metallic state in 1808 by Sir Humphry Davy, by decomposing the chloride by electricity, also by heating in a closed vessel iodide with sodium, but not in sufficient quantities to determine its properties. Pure calcium is of a pale yellow color and is a ductile and malleable metal. It occurs in nature as a carbonate, silicate, and sulphate, and forms a large constituent of all soils, ashes of plants, limestone, chalk, and marble. It is the main constituent of the mineral matter of the bones of animals, and forms large deposits as fluor spar, limestone, and gypsum. With carbon it forms the compound known as *calcium carbide,* which is used extensively in the manufacture of acetylene.

Calculating Machine (*ķăl'ķû-lā-tĭng*), a machine for making arithmetical calculations with speed and accuracy. Various devices have been made for this purpose, the simplest one being the abacus (*q.v.*). Leibnitz published the first description of a calculating machine in 1673. The British government employed Charles Babbage to construct a mechanism of this kind in 1821, and, after spending 12 years on the project, completed quite a satisfactory machine. Dorr E. Felt, in 1889, constructed a calculating machine with a keyboard resembling that of a typewriter, on which calculations can be made satisfactorily. By means of its operations, the fundamental principles of arithmetic can be performed, and the square and cube roots can be successfully extracted. The cash registers used in many business houses are a form of the calculating machine.

Calculating machines of a high grade are now in use in nearly all the banks, counting houses, and insurance offices. They have a keyboard like that of a typewriter, but the keys have figures so arranged that they stand in columns from 1 to 9. Calculating machines have from 10 to 91 figuring keys, while an average typewriter has 42 keys for writing. In many calculating machines the figures are impressed upon a strip of paper as the keys are touched, but some machines do not have paper tapes, and the result of a calculation is read from the machine. By pressing a special key, it is possible to obtain the result of addition, subtraction, multiplication, or division. Such machines are both electrically and manually operated. See also *Computer*.

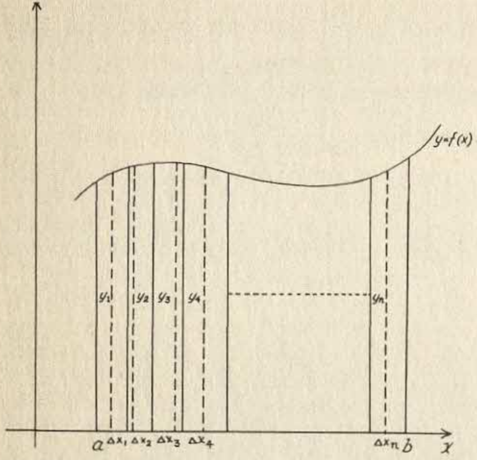
Calculus (*kăl′kū-lŭs*), a branch of mathematics which deals with problems involving rate of change. Before the advent of calculus, mathematics was concerned with static situations and could not deal with the constant change which is ever present in the world around us. Gradually men began to consider how to represent rate of change. Finally the genius of Newton and Leibnitz led them to see how to represent rate of change, and the calculus was born.

The driver of an automobile is constantly aware of the speed of his car and frequently notes his speed as indicated on the speedometer. Suppose that he looks at his speedometer and notes that the speed at that instant is 40 miles per hour. What is meant by this speed? To help in understanding instantaneous speed, consider the average speed of an auto during a short period of time. The average speed is the distance traveled divided by the time it takes to travel this distance. Thus, if an auto travels five miles in five minutes, its average speed is one mile per minute (or 60 miles per hour); if an auto travels 1.8 miles in two minutes, its average speed is .9 miles per minute. If the average speed is taken over shorter and shorter intervals of time, that is, as the time approaches zero, this limit is the instantaneous speed. If we denote the distance traversed by Δs and the time during which this distance is traversed by Δt, then the average speed may be denoted by $\frac{\Delta s}{\Delta t}$. Since the instantaneous speed is the limit of the average speed as the time, Δt, approaches zero, the instantaneous speed may be denoted by $\lim\limits_{\Delta t \to 0} \frac{\Delta s}{\Delta t}$.

Instead of considering speed, we might have considered some other rate of change; for example, the rate at which a balloon is expanding as gas is pumped into it, the rate at which a metal rod is expanding as it is heated, the rate of a chemical reaction as the concentration of the substances or the temperature is changed, etc. In general, we want to know the rate at which a function, $y = f(x)$, is changing. If the change in the value of the independent variable is denoted by Δx, and the corresponding change in the function is denoted by Δy, then the average rate of change of the function is denoted by $\frac{\Delta y}{\Delta x}$, and the instantaneous rate of change is denoted by $\lim\limits_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$. This limit is called the *derivative* of y with respect to x, or the *differential coefficient*. It is often denoted by $\frac{dy}{dx}$, or $D_x y$, or y'. Differential calculus is the subject in which the methods of computing the derivative and the applications of the derivative are studied.

Historically, the basic concept of the differential calculus arose out of an attempt to determine the maximum and minimum values of a function. At the maximum or minimum values of a function, which are the summits and valleys on the graph of the function, the tangent to the graph is horizontal. Thus this problem led to the problem of determining the tangents to a curve which was eventually solved by finding the slope of the tangent to a curve at any point on the curve. The slope of any line is the rate of rise per unit of horizontal distance; hence the problem of finding the slope of the tangent to a curve is essentially the same as that of finding the rate of change of a function.

In many natural phenomena we know the rates of change that are involved and we want to know the functional relation between the variables. For example, consider the flow of water as in a river. Suppose a wire basket is held in a fixed place in the river. The flow of water into the basket and the flow of water out of the basket are equal, for the water cannot be compressed or destroyed by the water flowing in. Thus, in this situation, we have two equal rates, the rate at which water flows in, and the rate at which it flows out. When this situation is expressed mathematically it leads to an equation involving derivatives to express the rates of flow. Equations in which derivatives appear are called *differential equations.* Almost all physical laws are stated mathematically as differential equations. When the differential equation is known, the problem of finding the functional relation between the variables arises. This is called *integrating* the differential equation. In the subjects of integral calculus and differential equations, such differential equations and the applications of integration to many situations are studied.



CALCULUS. CURVE $y = f(x)$

Although Sir Isaac Newton (1642-1727) and Gottfried Wilhelm Leibnitz (1646-1716) are often credited with the invention of calculus, its invention was actually the result of a long evolution in which they played a decisive part. Their most significant contribution to the calculus was the fact that they recognized that differentiation and integration are inverse operations. They discovered that the problem of integrating a differential equation is essentially the same as the problem of finding the area under a curve.

The question of finding the area under a curve had been studied for some time. In fact, the Greeks had some success with this problem. For example, they solved the problem of finding the area within a circle by the method of exhaustion. This method can be illustrated for the circle as follows. Inscribe a square in the circle and determine its area. Then bisect each of the arcs on a side of the square and join these points to the adjacent vertices of the square, forming an octagon, and determine its area. Again bisect the arcs and join the resulting points to the vertices of the octagon, forming a 16-sided polygon, and determine its area. Continue to increase the number of sides of the inscribed polygon in this way. The limit which is approached by the areas of these polygons is the area of the circle.

In calculus texts of the present day the area problem first considered is that of the area under a curve $y = f(x)$, bounded by two ordinates $x = a$, $x = b$ and the x-axis (see figure). The interval from a to b on the x-axis is subdivided into n parts of lengths $\Delta x_1, \Delta x_2, \Delta x_3, \ldots, \Delta x_n$. In each of these intervals any ordinate is chosen. The product of this ordinate by the width of the interval is approximately equal to the area under the curve in the interval. Thus the sum of all these areas is approximately equal to the area under the curve. This sum is $y_1 \Delta x_1 + y_2 \Delta x_2 + y_3 \Delta x_3 \ldots + y_n \Delta x_n$. If the number of subdivisions, n, is increased without bound, that is, n_{∞}, and the width of each interval approaches 0, then the limit which this sum approaches is taken as the area under the curve. It is called the definite integral of $f(x)$ from a to b and is denoted by $\int_a^b f(x)\,dx$. Newton and Leibnitz recognized that, if the rate of change $\frac{dy}{dx}$ of a function y is known, the function y is a definite integral.

Calcutta (*kăl-kŭt′tạ*), the largest city and leading seaport in India, the capital of West Bengal state, in the northeastern section of the Republic of India, on the Hooghly River, a branch of the Ganges, 86 m. from the Bay of Bengal; area, 34 sq. m.

The city is the metropolitan center for a group of suburban towns and districts, including Howrah on the opposite bank of the Hooghly, which are connected by a network of bridges and electric street railway lines. Calcutta was founded in 1690 by Job Charnock of the East India

CALCUTTA STREET VENDOR

British Official Photo

Courtesy Canadian Pacific Steamships, N. Y.

JAIN TEMPLE, CALCUTTA

Company. The early settlement, which gradually absorbed several neighboring hamlets, was later fortified and named Ft. William in honor of the King of England. In 1707 Calcutta became the capital of the Bengal presidency. It was attacked by Sirajuddanleh in 1756 and after a siege of two days was surrendered. At that time occurred the tragedy of the Black Hole, a small cell in Ft. William, in which 146 English prisoners were imprisoned on a hot summer night, and all but 23 perished. The city remained in the hands of Sirajuddanleh for six months, after which it was retaken by Clive (*q.v.*) and Adm. Charles Watson. It became the seat of the British government of India in 1772, and remained so until 1911, when the capital of India was shifted to New Delhi.

CALCUTTA BOTANICAL GARDENS

Courtesy Canadian Pacific Steamships, N. Y.

Calcutta is the commercial metropolis of Asia. Its extensive navigation facilities include, besides the river, several canals to facilitate trade with the adjacent territory. Railroad lines fanning out from the city facilitate a large interior, export, and import trade. Several botanical gardens and public parks beautify the city. The Univ. of Calcutta, the largest university in Asia, a well-organized public school system, and several academies make Calcutta the country's educational center. It has many temples, mosques, cathedrals, and churches, and many modern government and office buildings. In recent years a large number of learned societies have been organized for the study of antiquity, geology, astronomy, literature, history, and other lines of research. Numerous daily newspapers and many weeklies and other periodicals are published.

Branches of the street railway system extend to all parts of the city. A number of suburban railroad lines converge on the city. The industries located in the city are diversified, and the manufactured products are extensive, including fabrics, machinery, leather, ironware, furniture, cigars, clothing, and canned fruits. Cotton, indigo, raw silk, wheat, rice, tea, jute and jute products, and live stock are exported. The principal imports include cotton goods, salt, paper, hides, iron, and machinery.

It is the seat of the high court of the state of West Bengal. The custom house and public mint are among the many governmental buildings. The population consists mostly of Hindus and Mohammedans; there are also large numbers of Parsees and Europeans.

Population of Greater Calcutta, 1941, 2,610,256; in 1951, 2,548,677; in 1961, *ca.* 5,000,000.

Caldecott (*ḳa̤l′dê-ḳŭt*), RANDOLPH, artist, born in Chester, England, March 22, 1846; died Feb. 12, 1886. He was a bank clerk at Manchester, but took up the study of art, and in 1872 settled in London, where he made drawings for the leading magazines. In 1882 he was made a member of the Institute of Painters in Water Colors. He illustrated Washington Irving's "Old Christmas" and "Bracebridge Hall," and a series of picture books for children. The latter include "John Gilpin," "Elegy on the Death of a Mad Dog," and "The Great Panjandrum Himself."

Calderón de la Barca (*ḳäl-dâ-rōn′ dā lä bär′ḳä*), PEDRO, dramatist, born in Madrid, Spain, Jan. 17, 1600; died May 25, 1681. He was educated at the Jesuits' Coll., Madrid, and at Salamanca. He was 14 years old when he wrote his first play. He wrote about 400 preludes, dramas, and poems. He served with distinction in the wars against Milan and The Netherlands, and was honored by Philip IV, who was fond of theatrical amusements, and made him superintendent of the court festivals and theaters. After he took holy orders in 1651, his chief works were plays for the annual Corpus Christi festivals. Goethe and Schlegel translated his works into German and made them popular in Germanic countries. They abound in a brilliancy of imagination and richness of versification. Among the most noted are "The Physician of His Own Honor," "The Constant Prince," "Life Is a Dream," and "The Wonder Working Magician."

Caldwell (*ḳa̤ld′wẹl*), ERSKINE, author, born at White Oak, Coweta County, Ga., Dec. 17, 1903. The son of an itinerant Presbyterian minister, he left home at the age of 13 and traveled for several years, after which he completed his education. A variety of trades finally led him to writing, which he practiced for seven years before achieving publication. His first success was "Tobacco Road" (1932), which was later dramatized by Jack Kirkland. Subsequent fictional works include "God's Little Acre" (1933), "Journeyman" (1935), "Trouble in July" (1940), and "Jackpot" (1940). "You Have Seen Their Faces" (1939) was a pictorialized regional study done in collaboration with Margaret Bourke-White, to whom he was married for a time (1939-42). Later novels include "Georgia Boy" (1943), "This Very Earth" (1948), "A Place Called Estherville" (1949), "Claudelle Inglish" (1959); also an autobiography, "Call It Experience" (1951), and a story collection, "Courting of Suzie Brown" (1952).

Frequently criticized for a sordid naturalism which fails to stress any ideological solution, Caldwell is nonetheless considered one of the most accurate of living American regionalists.

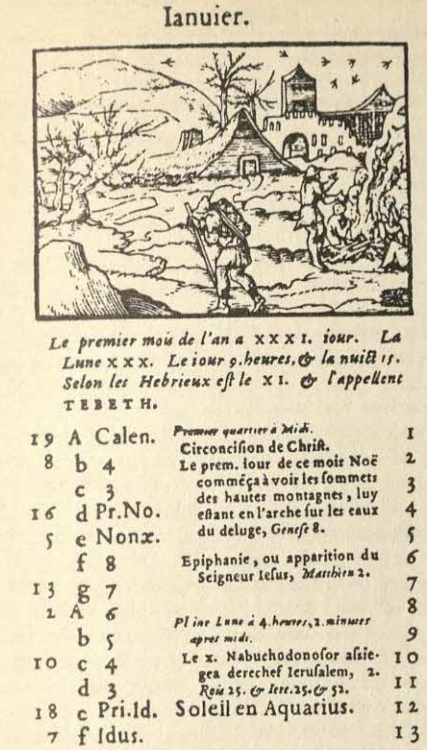
Caledonia (*ḳăl-ê-dō′nĭ-ȧ*), the ancient name of northern Britain, *i.e.*, Scotland. Tacitus gives a description of the defeat of the Caledonians in the year A.D. 84, on the Grampian Hills. Caledonia is now the poetical name of Scotland.

Caledonian Canal, a ship canal in Scotland, which connects the North Sea with the Atlantic Ocean. It is 60½ m. long and made up largely of a chain of natural lakes which have been united by artificial canals, thus making a waterway of much importance. The cut is 17 ft. deep, 50 ft. wide at the bottom, and 120 ft. at the surface. It shortens the route, which was formerly 500 m. long, by way of the Hebrides, whereas the route of the canal from Moray Firth to Loch Linnhe is about half that distance.

Calendar (*ḳăl′ĕn-dẽr*), a register or list by which the year is divided into months, weeks, and days, and showing the various civil and ecclesiastical festivals and holidays. It is so named from the Roman word *calends,* which was the first day of the month. The Egyptians based the year on the changes of the seasons, dividing it into 365 days, and these into 12 months of 30 days each, with five days added at the end of each year. Among the Jews it was customary to reckon 12 lunar months, adding a thirteenth to maintain the recurrence of particular days in consecutive seasons. The Greeks based their lunar months upon the fact that the new moon returned upon the same day of their year in a period of 19 years. It was found to be about six hours too long and calculators still failed to estimate correctly the beginning of the seasons on the same fixed day of the year.

The Romans based their calculations on the year of 10 months, including 365 days, which required about 11 days to be supplied at regular intervals. The great Greek astronomer Sosigenes, assisted by Marcus Fabius, at the request of Julius Caesar, devised the *Julian* calendar. In this system the equinox was restored to its proper place by counting two months between November and December, hence the year 707 (46 B.C.) contained 14 months. The year was computed at 365¼ days; the quarter of a day was added to February as a single day every fourth year. The Julian calendar continued in use until the fall of the empire, and was used by Christians until 1582.

Pope Gregory XIII abolished the Julian calen-



Ianuier.

Le premier mois de l'an a XXXI. *iour. La Lune* XXX. *Le iour 9. heures, & la nuict 15. Selon les Hebrieux eſt le* XI. *& l'appellent* TEBETH.

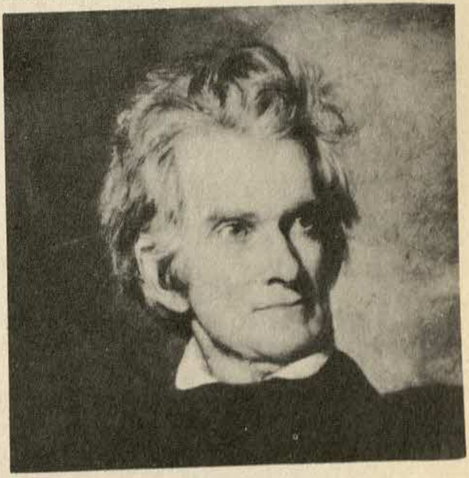
19	A	Calen.	*Premier quartier à Midi.* Circoncision de Chriſt.	1
8	b	4	Le prem. iour de ce mois Noë commēça à voir les ſommets des hautes montagnes, luy eſtant en l'arche ſur les eaux du deluge, *Geneſe* 8.	2
	c	3		3
16	d	Pr.No.		4
5	e	Nonæ.		5
	f	8	Epiphanie, ou apparition du Seigneur Ieſus, *Matthieu* 2.	6
13	g	7		7
2	A	6		8
	b	5	*Pleine Lune à 4. heures, 2. minutes apres midi.*	9
10	c	4	Le x. Nabuchodonoſor aſsiegea derechef Ieruſalem, 2. *Rois* 25. & *Iere.* 25. & 52.	10
	d	3		11
18	c	Pri.Id.	Soleil en Aquarius.	12
7	f	Idus.		13

16TH CENTURY FRENCH CALENDAR

dar in all Catholic countries and introduced a reformed calendar called the *Gregorian.* Accordingly, 10 days were deducted from the year 1582, by which Oct. 5, according to the old calendar, was reckoned Oct. 15, 1582, by the new; and, to prevent displacement recurring, every fourth year was counted a leap year, in which February was assigned 29 days instead of 28. Under this system, only one in four of the years ending centuries is a leap year; thus, 1700, 1800, 1900 were not leap years; while 2000 will be. The Gregorian year contains 365 days, 5 hours, 49 minutes, and 12 seconds. To distinguish it from the other systems, it was designated the *new style,* and previous calculations became known as the *old style.* The new style was adopted in France, Spain, and Portugal in 1582, and in the Catholic portions of Germany, Switzerland, and The Netherlands in 1583. Poland adopted it in 1586; Hungary in 1587; Holland, Denmark, and Protestant Germany adopted it in 1700; Switzerland in 1701; England in 1752; and Sweden in 1753. Of the Christian countries, Russia retained the old style longest, until 1902.

Calgary (*kăl'gȧ-rĭ*), a city of Canada, in the province of Alberta, on the Canadian Pacific and Canadian National Railways. It is in a region that is devoted chiefly to cattle and horse ranching, 835 m. w. of Winnipeg. The chief enterprises are soap works and railroad shops. It is a shipping point for cereals and livestock. Calgary was incorporated in 1885. Population, 1941, 88,904.

Calhoun (*kăl-hōōn'*), JOHN CALDWELL, statesman, born in Abbeville, S.C., Mar. 18, 1782; died at Washington, D.C., Mar. 31, 1850. He descended from an Irish family that had settled in South Carolina at an early date. His parents were too poor to provide the means necessary for him to obtain a regular schooling, but he studied under his brother-in-law and became fitted to enter the junior class at Yale. After graduating in 1804, he studied law and began to practice at Abbeville. Being of meditative disposition, he developed qualities of statesmanship at an early age. He was elected to Congress in 1811, where he became a distinguished leader of the Democratic party by advocating the War of 1812 against England. In 1817 he was appointed by President Monroe to the Department of War, and in 1824 was elected Vice-President with John Quincy Adams. Four years later he was elected Vice-President with Jackson, but the two prominent leaders of the Democratic party soon became opposed to each other. In 1832 the Legislature of South Carolina passed the famous Nullification Act, which provided "that any State in the Union might annul an act of the Federal government." The states of Virginia, Georgia, and Alabama supported this act and threatened to dissolve the Union.



Courtesy Brown Bros., N. Y.

JOHN C. CALHOUN

Calhoun, being in sympathy with the legislature in his own state, resigned the Vice-Presidency and was elected to the Senate, where he championed states' rights. He was Secretary of State in Tyler's administration, during which time he concluded a treaty of annexation with the Republic of Texas. He retired from the Cabinet in 1845 and re-entered the Senate, resuming the leadership of the Southern states, and established a reputation with Clay and Webster as a great debater; the three were often referred to as "the great trio." It is commonly thought that in gifts of logic he surpassed both Clay and Webster. He spent many years in writing his work, "Philosophy of Government," in which the doctrine of state sovereignty is vindicated, and which was published soon after his death.

Cali (*kä'lē*), a city in western Colombia, seat of Valle del Cauca Department, near the junction of the Cali and Cauca rivers, 185 m. s.w. of Bogotá. It is situated on a tableland about 3,140 ft. above sea level and is a major communications, trading, and industrial center. Coal and gold mines are nearby. A railway connects it with Buenaventura, on Chocó Bay. Cali was founded in 1536 and still has many old colonial buildings. Population, 1962 (est.), 693,120.

Caliber (*kăl'ĭ-bẽr*), the diameter of the bore of a gun. The caliber of small arms is expressed in inches, while that of artillery is ordinarily expressed in metric units. Military rifles are ordinarily of caliber 0.30 inches and submachine guns are usually 0.45 inches caliber. Armor-piercing bullets in calibers 0.30 inches and 0.50 inches are standard. The term caliber is also used to express length of a gun barrel from breech to muzzle in terms of the diameter. Thus a 16-in., 50-caliber naval rifle or gun would mean a gun having a 16-in. bore, which is 50 × 16 in., or 66 2/3 ft., in length from breech to muzzle.

Calico (*kăl'ĭ-kō*), the general name of cotton cloths having colored patterns printed on them. Calicoes are coarser than muslin, and in Europe they include shirting and common white cotton cloth. Calico printing was first practiced in India and is used to some extent in stamping woolen, silk, and linen goods, but it is employed principally in stamping the cloth known in the market as calico. The process was brought to Germany and France by the Dutch, and later to England by a Protestant refugee who left France in 1696. Calico prints are now among the most staple articles of manufacture. The printing was first done by wooden blocks, on which the patterns were engraved. At the present time most of the printing is done by large machinery and cylinder presses, in which the colors are put on rollers and passed over the cotton cloth. There are as many rollers as colors to be printed, each roller containing a separate color, and each one filling its own place in the pattern.

Formerly as many impressions were made in printing as the number of colors that were required in completing the pattern, but by employing a number of rollers and the cylinder process all colors are printed by passing the cotton cloth through the press but one time. Each of the rollers is supplied with figures of the pattern raised above the surface of the roller, by means of which the dye colors or steam colors are fixed to the cloth in a becoming way. In printing the cloth passes through the machine, thence over a hot-air chamber, which dries the cloth. It is then steamed and washed and, after being starched and pressed, it is put in bales ready for the market. The colors used in printing are variously made of animal, vegetable, and mineral compounds, depending upon the class of prints to which they are to be applied. In the newer process of calico printing, which has largely supplanted all others, it is possible to combine printing and dyeing. Cloth on which the colors are merely stamped is apt to fade easily, and by the use of the newer process it is possible to obtain colors that will not fade, known in the market as *fast colors.* This process employs mordants to a large extent.

California (*kăl-ĭ-fôrn'yą*), a state in the Pacific section of the U.S., noted for its size, geographical contrasts, natural wealth, and productivity of soil. Known the world over as an international leader in motion-picture production, it ranks first among the states in value of agricultural production and is among the leading manufacturing and lumbering states.

The state is bounded on the N. by Oregon, on the E. by Nevada and Arizona, on the S. by Mexico, and on the W. by the Pacific Ocean. Its west coast comprises about three-fifths of the western coast line of the continental U.S. California ranks third in size among the states and was second in population, according to the 1960 Decennial Census of Population (the District of Columbia is included in both rankings). According to the 1963 estimates of civilian population, however, it became first in population in that year. The state's name is thought to have come from a 15th-century Spanish novel, *"Las*

THE GREAT SEAL OF THE STATE OF CALIFORNIA.
EUREKA

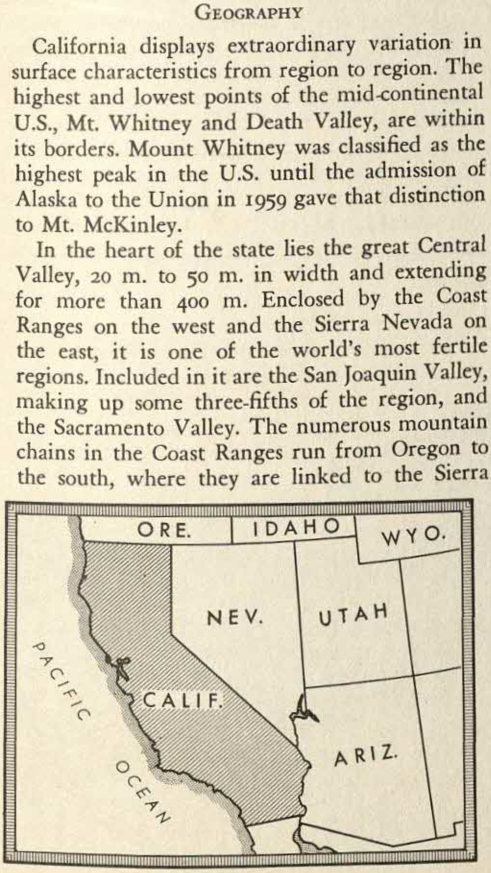
Sergas de Esplandían" (The Deeds of Esplandían), by Garcí Ordóñez de Montalvo. The heroine of this romance, *Calafía,* was ruler of a fabulous island called California, and the name was first applied to Lower California, now a territory of Mexico. The state nickname is the "Golden State."

Location	Between ca. 114°7' and 124°29' W. long. and 32°30' and 42° N. lat.
Area	158,693 sq. m.
Land	156,573 sq. m.
Inland water	2,120 sq. m.
Greatest extent:	
North to south	ca. 780 m.
East to west	350 m.
Population (1960)	15,717,204
Capital city	Sacramento
Highest point	Mt. Whitney (14,495 ft.)
Lowest point	282 ft. below sea level, in Death Valley
Admitted to the Union (31st state)	1850
Song	"I Love You, California," words by F. B. Silverwood, music by A. F. Frankenstein
Flower	Golden poppy
Bird	California Valley quail
Motto	*Eureka* (Greek, meaning "I Have Found It")
Flag	See color plate in Vol. XI

GEOGRAPHY

California displays extraordinary variation in surface characteristics from region to region. The highest and lowest points of the mid-continental U.S., Mt. Whitney and Death Valley, are within its borders. Mount Whitney was classified as the highest peak in the U.S. until the admission of Alaska to the Union in 1959 gave that distinction to Mt. McKinley.

In the heart of the state lies the great Central Valley, 20 m. to 50 m. in width and extending for more than 400 m. Enclosed by the Coast Ranges on the west and the Sierra Nevada on the east, it is one of the world's most fertile regions. Included in it are the San Joaquin Valley, making up some three-fifths of the region, and the Sacramento Valley. The numerous mountain chains in the Coast Ranges run from Oregon to the south, where they are linked to the Sierra Nevada by a lesser range, the Tehachapi Mts.; elevations range up to *ca.* 8,800 ft. The Klamath Mts. and the Cascade Range (which includes Lassen Peak, the only active volcano in the mid-continental U.S., and glacier-covered Mt. Shasta) provide a northern link between the Coast Ranges and the Sierra Nevada. The Sierra Nevada is a great, rugged mountain system rimming the Central Valley on the east and running parallel with the Coast Ranges. It extends for some 430 m. and contains Mt. Whitney and the Yoesmite Valley of the upper Merced River. A good part of California's mineral resources—gold, copper, and zinc—are found in this range. Portions of the state's northeast and eastern border lie within the Great Basin and Range region. In the extreme southeast is the Mojave Desert, an arid expanse of some 15,000 sq. m. receiving only 3 in. to 5 in. of rain per year, although underground reservoirs occur in many places. This desert region is being used increasingly for recreation and military purposes. Immediately south is the Colorado Desert, in the southern portion of which is the Imperial Valley, a region made productive by the All-American Canal. Built by the U.S. Bureau of Reclamation (1934-40), this canal brings the waters of the Colorado River into the valley, much of which is below sea level; most notable is the Salton Sea, a salt-water lake 244 ft. below sea level. Large Pacific inlets include San Francisco Bay and its northern extension, San Pablo Bay; Monterey Bay; and the Gulf of Santa Catalina. Off the southern coast are the Santa Barbara Islands, a chain that includes Santa Cruz (the largest), Santa Barbara, Santa Catalina, and Santa Rosa islands. The Farallon Islands are a small group *ca.* 35 m. w. of the Golden Gate.



The two great rivers of the interior are the Sacramento and the San Joaquin. The Sacramento rises in the north near Mt. Shasta, and flows south and west into San Francisco Bay. The San Joaquin rises in the Sierra Nevada and flows in a northwesterly direction, joining the Sacramento. The Colorado River in the southeast forms all of the boundary between Arizona and California.

Among the most beautiful features of the state is Lake Tahoe, situated in the Sierra Nevada at an elevation of 6,225 ft. It is the center of a tourist resort.

The state has many notable landmarks in addition to its four national parks, which include Sequoia and Yosemite. Especially outstanding are the 21 Franciscan missions extending from San Diego to Sonoma; built by native Indian labor, they were placed to be a day apart by horseback. The earliest of the missions is San Diego de Alcalá, founded in 1769 by Father Junípero Serra at San Diego. Others are San Juan Capistrano (founded 1776), in the town of the same name, destroyed by the earthquake of 1812 and later rebuilt; and San Carlos Borromeo (founded 1770) at Carmel, the burial place of Father Serra. Hollywood, long the nation's film capital and today a major radio and television broadcasting center, draws tourists from all parts of the world. Nearby Beverly Hills is the home of many of the important figures in the entertainment world.

San Francisco boasts one of the largest suspension bridges in the world, the Golden Gate Bridge (opened 1937) across the entrance to San Francisco's harbor. The main span of this bridge is the longest ever built—4,200 ft. in length. Opposite Golden Gate is 12-acre Alcatraz Island, formerly the site of a Federal prison for dangerous criminals. On Mare Island in San Pablo Bay is a U.S. Navy yard. Treasure Island, artificially created in San Francisco Bay as the site of the Golden Gate International Exposition (1939-40), is currently a naval base. San Francisco's Chinatown is the largest Chinese community outside the Orient. At Pasadena is the Rose Bowl, scene of a classic annual New Year's Day football game. At Coloma, 45 m. E. of Sacramento, a statue commemorates James W. Marshall, whose discovery of gold here, on Jan. 24, 1848, touched off the gold rush of that and the following year.

Climate: The state has some six distinct climatic zones, each being determined by distance from the ocean, relationship to mountain ranges, altitude, and amount of rainfall. Generally, however, the weather is mild along the coast and in the interior valleys where most of the population lives. Rainfall is concentrated in the winter months, with almost none occurring from May to October. Winter temperatures in these areas seldom drop as low as 32° F., and where summer heat occurs it is dry, although ocean fogs occur along the coast.

Sunshine and dry warmth can be found in the desert areas of the southeast, such as at Palm Springs, a noted resort. A large part of the state is high mountain country, where winter temperatures fall as low as 30° F. below zero, and rivers and lakes freeze.

	San Francisco	*Sacramento*	*Los Angeles*
Normal temperatures			
January	50.1° F.	45.2° F.	55.0° F.
July	58.9° F.	75.3° F.	72.5° F.
Annual mean	56.7° F.	60.9° F.	63.9° F.
Latest frost	Jan. 7	Feb. 6	Jan. 3
Earliest frost	Dec. 29	Dec. 10	Dec. 28
Precipitation			
January	4.03 in.	2.86 in.	2.38 in.
July	0.01 in.	Trace	Trace
Annual	20.51 in.	16.32 in.	14.54 in.
Average growing season	356 days	307 days	359 days

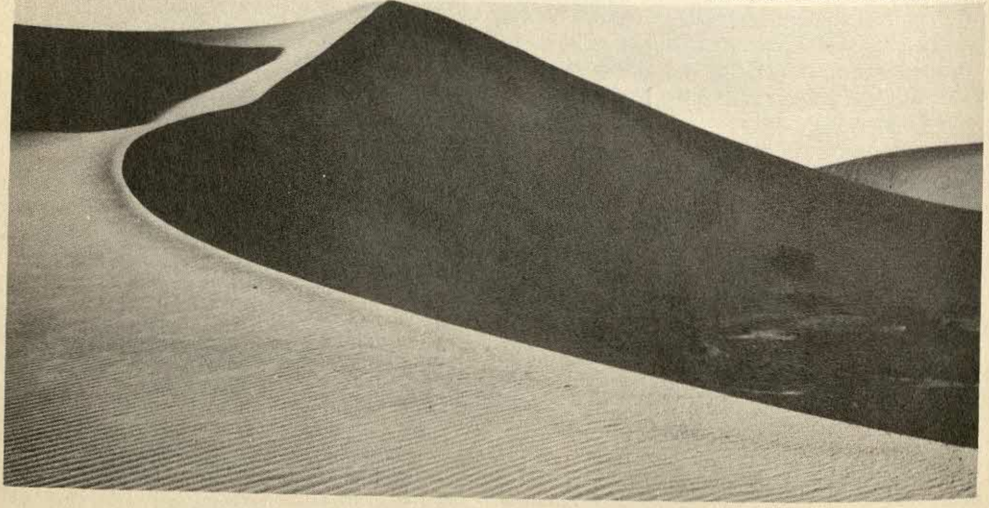
NATURAL RESOURCES

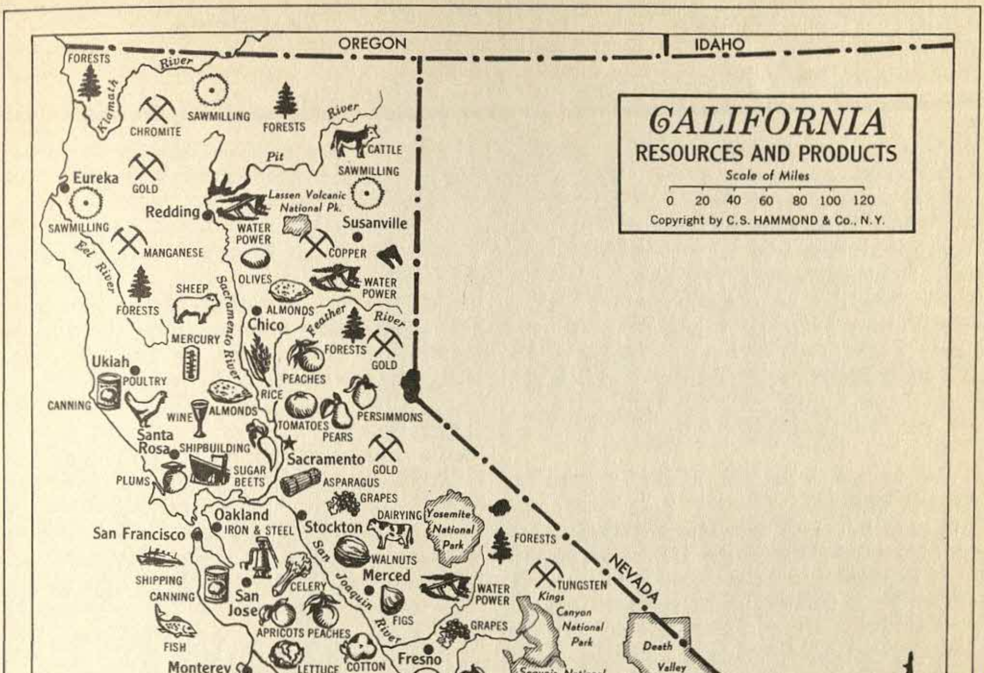
California has abundant natural wealth. It ranks third among the states in mineral production. Gold, discovery of which led to the development of the state, yielded a return of $2,386,000,000 from 1848 through 1957. By 1961, however, California no longer held a top place in gold output, the importance of this mineral having been overshadowed by the development of other mineral resources. In 1961, the state ranked third in production of petroleum and fourth in that of

DEATH VALLEY

The desert, formerly the bed of a salt lake, is 282 ft. below sea level at its lowest point

Courtesy Ewing Galloway, N. Y.





natural-gas liquids and was among the leaders in asbestos and cement. Oil was discovered in California *ca.* 1861; by 1960 the state had 37,771 oil wells. Between 1951 and 1961 an estimated 981,691,000 bbl. of crude petroleum were produced. Petroleum fuels are found mostly in the southern San Joaquin Valley, the central coast area, and the Los Angeles coastal plain. Other minerals in which the state ranked high in output in 1961 were boron, feldspar, gypsum, magnesium compounds, mercury, natural gas, potassium, pumice, pyrites, sand and gravel, sodium carbonate, sodium sulfate, sulfur, talc, rare-earth and thorium concentrates, and tungsten. Minerals that occur in the state in smaller quantities are asbestos, bromine, lead, molybdenum, uranium, and zinc.

The forests of the Sierra Nevada, the southern Cascades, and the northwest provide great amounts of lumber. Ponderosa pine is taken from the mountains of the interior; redwood, from the northwest. Other species include the Douglas fir, oak, cedar, spruce, hemlock, and yellow and sugar pines. The state has 42,541,000 acres of forest land; the total stand of live sawtimber is 360,001,000,000 bd. ft.

California has more of its forest land—24,279,000 acres—incorporated in national forests than any other states except Alaska and Idaho.

Utilization of the river waters for irrigation and hydroelectricity has also enriched the state.

A tremendous area in the interior valley has been irrigated, for example, by means of the Central Valley Reclamation Project, begun in 1935 and with units still being added. Among the dams here are Shasta Dam (at its completion in 1945 second in height to Hoover Dam in the U.S.), on the Sacramento River; Folsom Dam, on the American River, a tributary of the Sacramento; and Friant Dam, on the San Joaquin.

Fish and seafood are abundant, with large quantities of tuna, abalone, anchovy, crab, mackerel, rockfish, sole, and sardine being caught. The climate has made California an all-year playground for tourists.

California's Economy

At the time of the 1960 census, California had an employed population of 5,761,433. Of this total, *ca.* 24 per cent were in manufacturing; 6 per cent in construction; 5 per cent in agriculture, forestry, and fisheries; and 0.5 per cent in mining. The remainder were employed in the wholesale and retail trades, in government, and in supplying various personal, professional, and other services.

In value produced by its manufacturing activities, California ranked second only to New York in 1961. It is one of the nation's leading producers of aircraft, which constituted, along with other transportation equipment, the state's most valuable manufacturing category (1961 value added by manufacture, $2,584,475,000). Food processing (valued at $2,276,015,000 in 1961) was the second most important manufacturing activity. California is the nation's leading supplier of dried, canned, and frozen foods and of wine. Other major manufactures are electrical machinery, fabricated metal products, nonelectrical machinery, apparel, lumber and wood products, primary metals, and chemicals. The state is also the U.S. center for motion-picture production. The total value added by manufacture of the state in 1961 was $14,305,061,000.

There were 99,274 farms in California in 1959, occupying a total of 36,888,000 acres. The average farm had 372 acres, with land and buildings valued at $131,212.

California ranks foremost in the nation in value of agricultural production. It is a leading U.S. supplier of a wide variety of crops, including citrus and other fruits, nuts, cotton, potatoes, barley, sugar beets, hay, tomatoes and other vegetables, berries, and melons. Of the 1961 farm marketing receipts (totaling $3,223,647,000) 60 per cent were derived from crops—*ca.* 19 per cent from fruits and nuts, 16 per cent from vegetables, 10 per cent from cotton, and 6 per cent from animal feed crops. The most important sources of livestock income were the sales of meat animals, mainly cattle and calves (representing 17 per cent of 1961 farm marketing receipts), dairy products (12 per cent of marketing receipts), and poultry and eggs (9 per cent of marketing receipts).

California also has many commercial fisheries. Its 1960 catch, totaling 540,837,000 lb. and valued at $49,578,000, outranked in value the catch of every other fishing state.

The mineral output of California was valued at $1,420,749,000 in 1961, comprising 7.84 per cent of total U.S. mineral production and placing California third among the states. The principal minerals, in order of value, were petroleum, natural gas, cement, and sand and gravel.

With its sunshine, ocean beaches, desert resorts, historic places, and mountain skiing, California has a large tourist income. In 1961, for example, 1,227,000 persons visited Yosemite National Park and 610,000 visited Sequoia National Park. Disneyland, children's amusement park at Anaheim, attracts an enormous attendance. Squaw Valley, a ski resort near Truckee, achieved fame when it was selected as the site for the 1960 winter Olympic Games.

Transportation and Communication

California has improved its transportation greatly since 1940, with a system of freeways, or multilane highways. The state's total rural and municipal road system totaled 147,370 m. in 1960; there were 44,026 m. of unpaved rural roads. As in many other sections of the country, traffic congestion presents a problem. Railroad facilities are highly developed within the state, as well as for service to points across the nation. Among the chief railroads are the Atchison, Topeka & Santa Fe and the Great Northern Rys., the Northwestern Pacific R.R., the Sacramento Northern Ry., and the Southern Pacific, Union Pacific, and Western Pacific R.R.'s. The first railroad in the state was the Sacramento Valley R.R. (Feb. 22, 1856). Miles of line operated in 1959 totaled 8,320 m. The state has more airfields and airports than any other except Texas and has extensive nationwide air service, including service to Hawaii, as well as to other points in the Pacific. Los Angeles is an outstanding air center, with an international airport. The state is linked to all points of the globe by the shipping activities of Los Angeles and San Francisco, two of the nation's great ports. Both the Sacramento and the San Joaquin rivers are used as inland shipping routes.

California had 281 radio stations and 30 television stations in 1961. The first newspaper published in the state was the *Californian* (1846), at Monterey. Among today's leading papers are the Los Angeles *Herald-Examiner* and *Times;* the San Francisco *News-Call Bulletin, Chronicle,* and *Examiner;* the Oakland *Tribune;* and the Sacramento *Bee.*

THE DAYS OF THE "FORTY-NINERS"

The Currier and Ives print (*right*) depicts a scene which was only too familiar in mid-19th-century California. The discovery of gold at Sutter's Mill in El Dorado County in 1848 was followed by a gold rush of immense proportions. "Gold fever" ran rampant, as men dreamed of acquiring fabulous fortunes (*courtesy Library of Congress*)

HISTORIC SITES

A Carmelite mission (*left*) is one of the many beautiful examples of the early Spanish structures in California (*courtesy TWA*). An old Spanish lighthouse atop Point Loma (*center left*), at the entrance to San Diego Bay, was in use until 1891. It is located in an area which was proclaimed as Cabrillo National Monument by President Woodrow Wilson in 1913 (*courtesy Sante Fe Ry*). A picturesque chapel (*bottom left*) was built by Russian fur traders, who established Ft. Ross, about 75 m. N. of San Francisco, in 1812. Ruins of the old fort, which the Russians held for about 30 years, were restored by the state (*courtesy Redwood Empire Assn.*). The Wawona Tunnel Tree (*below*) is in the Mariposa Grove of Big Trees, in Yosemite National Park, one of the state's famous parks and forests. The opening in the base of the tree was cut in 1881 so that high-wheeled stage coaches could pass through it. The life and growth of the great tree has not been impaired by this drastic surgery

ANNUAL EVENTS

Tournament of Roses	Jan. 1; Pasadena
Rose Bowl football game	Jan. 1; Pasadena
Chinese New Year	January or February
Spring Garden Show	First week in April; Oakland
Ramona Pageant	Last two week ends of April, first week end of May; at Hemet; a dramatization of Helen Hunt Jackson's novel of the Southwestern Indians, "Ramona"
Easter Sunrise Service	Easter morning; Hollywood Bowl
Burbank Rose Festival	May; Santa Rosa
California Rodeo	June; Salinas
Bach Festival	July; Carmel
Old Spanish Days	August; Santa Barbara
State Fair	September; Sacramento
Admission Day	Sept. 9; throughout the state
49ers Encampment	November; Death Valley

POPULATION

California has 58 counties. The 1960 census population was 15,717,204 (1962 est. population, 16,970,000), an increase of 48.5 per cent over that of 1950. The urban population comprised 13,573,155, or 86.4 per cent; the rural population, 2,046,803, or 13.6 per cent. Between 1950 and 1960, the urban population rose 58.9 per cent over that of 1950; the rural population increased 4.8 per cent. More than 87 per cent of the 1960 urban population lived in the urbanized areas of Los Angeles-Long Beach, San Francisco-Oakland, San Diego, San Jose, Sacramento, San Bernardino-Riverside, Fresno, Pomona-Ontario, Bakersfield, Stockton, and Santa Barbara. Of the 1960 population, white persons numbered 14,455,230; of the 1,261,974 nonwhites, 883,861 were Negroes, 157,317 were Japanese, 95,600 were Chinese, 65,459 were Filipinos, and 39,014 were Indians. Native-born residents totaled 14,377,162; the foreign-born, 1,343,698. Population density in 1960 averaged 100.4 per sq. m., compared with a figure of 67.5 in 1950.

The major religious bodies are the Roman Catholic and the Protestant, with the Church of Jesus Christ of Latter-day Saints (Mormons) and a sizable Jewish group. The predominant Protestant denominations are the American Baptist Convention, The Methodist Church, the Protestant Episcopal Church in the U.S.A., and The United Presbyterian Church in the U.S.A.

Chief Cities: Sacramento, the capital, on the Sacramento River, is an industrial, distribution, and trade center, known for its food processing.

Los Angeles, in southwestern California, is one of the great cities of the nation and the largest in the state. It is a major industrial city, a seaport, and an air and rail center.

SAN FRANCISCO STREET SCENE IN THE 1870's

Courtesy Bettmann Archive, N. Y.

San Francisco, on San Francisco Bay, the second-largest city, is a leading U.S. port and a center of industry, finance, and commerce.

Long Beach, 20 m. s. of Los Angeles, is a beach resort on San Pedro Bay, with a number of industries and many oil wells.

Oakland, on San Francisco Bay opposite San Francisco, with which it is linked by bridge, is an important port and industrial city.

San Diego, a seaport on San Diego Bay, is a resort city, the site of an important U.S. naval base, and a center of the tuna industry.

Other cities of more than 100,000 population are San Jose, Fresno, Glendale, Pasadena, Berkeley, Torrance, and Santa Ana.

Famous Californians: Atherton, Gertrude Franklin Horn (1857-1948), novelist, who utilized California history in many of her books.

Bancroft, Hubert Howe (1832-1918), Ohio-born historian, who amassed a great collection of material on Western American history (now in the Bancroft Library at the Univ. of California, Berkeley).

Crocker, Charles (1822-88), who came to California as an 1849 seeker of gold and became one of the four organizers of the Central Pacific Railroad Co. of California, the state's first railroad to offer transcontinental service.

De Mille, Cecil Blount (1881-1959), Massachusetts-born motion-picture pioneer noted for his production of religious and historical epic films.

de Young, Michel Harry (1849-1925), journalist, who, with his brother Charles de Young (1847-80), founded the San Francisco *Chronicle*

Frémont, John Charles (1813-90), Georgia-born general and explorer; U.S. Senator (1850-51).

Field, Stephen Johnson (1816-99), Connecticut-born jurist who was much concerned with the drafting of early California statutes and U.S. mining law; Associate Justice of the U.S. Supreme Court (1863-97).

Hopkins, Mark (1813-78), immigrant to California, who, with his partner, Collis P. Huntington, was a founder of the Central Pacific Railroad Co.

Huntington, Collis Potter (1821-1900), 1849 gold-rush immigrant who, with his partner, Mark Hopkins, joined with Charles Crocker and Leland Stanford in organizing the Central Pacific Railroad Co. He later organized the Southern Pacific.

Huntington, Henry Edwards (1850-1927), nephew of Collis P. Huntington, developer of railroads and other utility systems and donor of the library and art gallery bearing his name at San Marino, Calif.

Johnson, Hiram Warren (1866-1945), U.S. Senator (1917-45), and twice elected (1910, 1914) governor.

London, Jack (1876-1916), journalist and author who, at his peak, was the highest-paid and best-known writer in the world.

Nixon, Richard Milhous (1913-), Vice President of the U.S. (1953-61).

Norris, Kathleen (1880-), novelist, wife of novelist Charles Gilman Norris (1881-1945).

Stanford, Leland (1824-93), New York-born co-organizer of the Central Pacific R.R. Co.; governor of California (1861-63); founder of Stanford Univ.

Sutter, John Augustus (1803-80), Swiss-born frontiersman, whose discovery, with James Wilson Marshall (1810-85), of gold at Sutter's Mill, Coloma, led to the famous California gold rush of 1849.

Warren, Earl (1891-), Chief Justice of the U.S. Supreme Court (1953-); three times governor of California.

EDUCATION

Education is free and compulsory on a full-time basis for children between eight and 16 and on a parttime basis for those between 16 and 18. The public-school system was established in 1849. Public-school attendance was 3,755,000 in 1962, and parochial-school attendance, 283,800. The leading state-supported institution of higher learning is the Univ. of California (*q.v.*). There are state colleges at Chico, Fresno, Long Beach, Los Angeles, Sacramento, San Diego, San Francisco, and San Jose; Alameda County State Coll. is at Hayward; California State Polytechnic Coll., at San Luis Obispo; Humboldt State Coll., at Arcata; Orange County State Coll., at Fullerton; Sonoma State Coll., at Cotati; and Stanislaus State Coll., at Turlock. The many private institutions include the California Inst. of Technology, Mills Coll., Occidental Coll., Pomona Coll., Scripps Coll., Stanford Univ., the Univ. of San Francisco, the Univ. of Santa Clara, the Univ. of Southern California, and Whittier Coll.

Among cultural institutions are the Crocker Art Gallery, Sacramento; Griffith Observatory and Planetarium, on Mt. Hollywood, Los Angeles; the Henry E. Huntington Library and Art Gallery, San Marino, with manuscripts of rare books and masterpieces of British painting; the Fine Arts Gallery of San Diego; the California Acad. of Sciences, San Francisco, including a planetarium, aquarium, and natural history museum; the California Palace of the Legion of Honor, San Francisco; the San Francisco Museum of Art, with notable modern paintings; the Fine Arts Gallery of San Diego, with a number of paintings by old masters; and the Palomar Observatory, with its 200-in. telescope.

GOVERNMENT

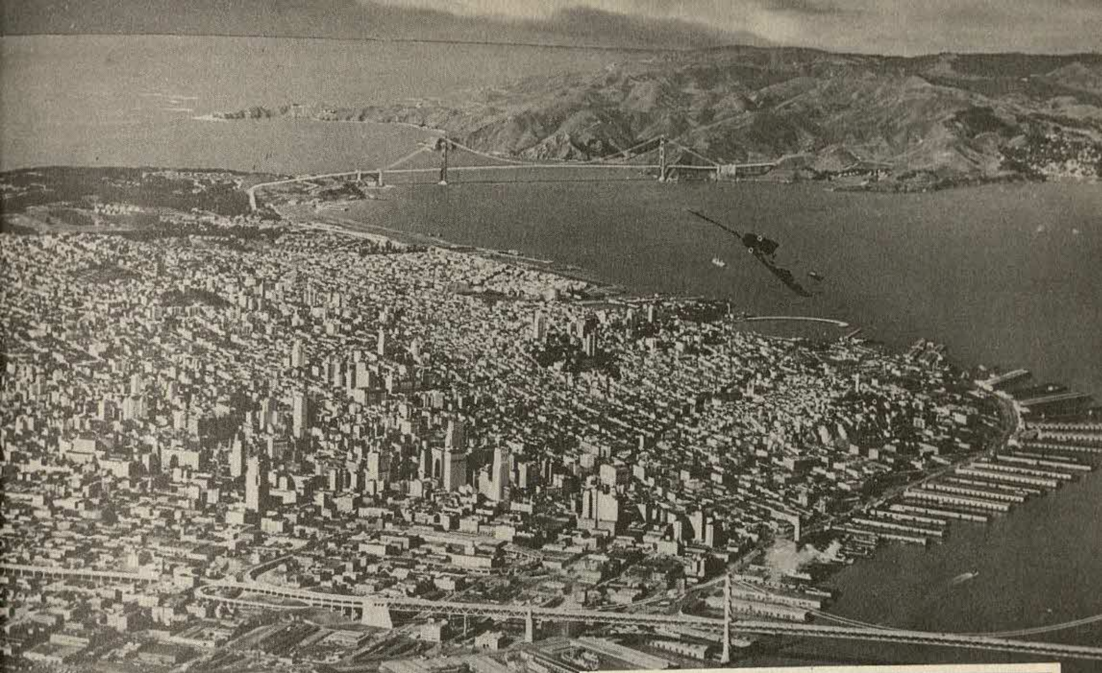
California is governed under the provisions of a constitution (its second) ratified in 1879. More than 335 amendments have been made. Execu-

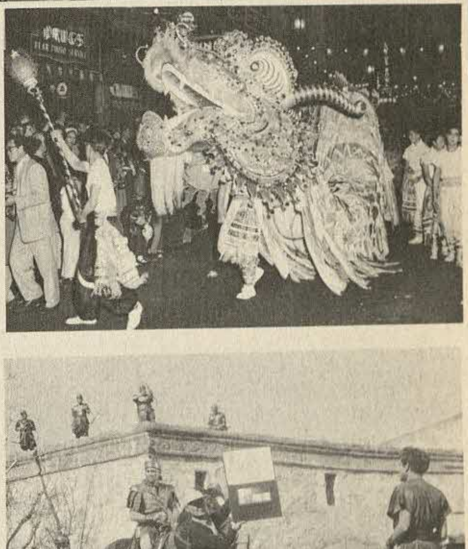
MAJOR RECREATIONAL AND HISTORIC FEATURES

Name and Type	*Size and Location*	*Points of Interest*
Kings Canyon National Park (established 1940)	454,650 acres in the Sierra Nevada, near Fresno (state 65, 180)	Two canyons of the Kings River and peaks of the High Sierra in mountain wilderness; a section, formerly Gen. Grant National Park, contains giant sequoias
Lassen Volcanic National Park (established 1916)	106,934 acres in the southern part of the Cascade Range, near Redding (state 44, 89)	Lassen Peak, the nation's most recently active volcano; bubbling mud pots, a boiling lake, and Cinder Cone are evidences of volcanic activity
Sequoia National Park (established 1890)	386,551 acres in south central California, near Fresno (state 180, 198)	Vast groves of giant sequoias, including the Gen. Sherman tree (272.4 ft.), thought to be the oldest living thing
Yosemite National Park (established 1890)	760,951 acres in central California, near Merced (U.S. 395; state 41, 120, 140)	Granite cliffs carved out by Merced River and later by glaciers; waterfalls, three groves of giant sequoias
Cabrillo National Monument (established 1913)	80.5 acres in a military reservation atop Point Loma, near San Diego (U.S. 80, 101, 395; state 75, 94)	Commemorates Juan Rodríguez Cabrillo, who discovered San Diego Bay and landed at Ballast Point in 1542
Death Valley National Monument (established 1933)	1,907,760 acres, of which 1,792,520 acres are in eastern California and the remainder in Nevada (U.S. 95; state 58, 72, 127, 190)	Desert with salt beds and borax formations; includes Badwater, a pool 280 ft. below sea level; a nearby spot 2 ft. lower is the lowest point in the U.S.
Devil's Postpile National Monument (established 1911)	798 acres in central California (off U.S. 395)	Strange blue-gray basaltic columns up to 60 ft. high; evidence of basaltic lava flow
Joshua Tree National Monument (established 1936)	557,992 acres in southern California (off U.S. 60, 70, 99)	Preserves the Joshua tree and many desert plants and animals, including the desert bighorn
Lava Beds National Monument (established 1925)	46,239 acres in northern California (off U.S. 97; state 139)	Battleground of the Modoc Indian War of 1873; contains volcanic caves and tunnels
Muir Woods National Monument (established 1908)	504 acres on the slopes of Mt. Tamalpais, northwest of San Francisco (U.S. 101; state 1)	Magnificent grove of redwoods (*Sequoia sempervirens*)
Pinnacles National Monument (established 1908)	14,498 acres in west central California, southwest of Salinas (U.S. 101)	Rocky spires, domes, and caves formed by volcanic action
Point Reyes National Seashore (established 1962)	7-m.-long peninsula on northern coast of California, 30 m. N.W. of San Francisco	Wide, sandy beaches; rocky, steep bluffs with caves; 3-m.-long sandspit
Eldorado National Forest (established 1910)	885,827 acres near Placerville; the remainder in Nevada (U.S. 50; state 88)	In the Sierra Nevadas; hundreds of mountain lakes, Including part of Lake Tahoe; site of Sutter's Mill
Inyo National Forest (established 1907)	1,828,986 acres near Bishop; the remainder in Nevada (U.S. 6, 395; state 168)	In the Sierra Nevadas; includes wilderness and wild areas, Palisade Glacier, and Mt. Whitney
Klamath National Forest (established 1905)	1,895,427 acres near Yreka; the remainder in Oregon (U.S. 99; state 96)	Klamath River and tributaries, noted for fishing; Marble Mt. and Salmon-Trinity Alps wilderness areas
Plumas National Forest (established 1905)	1,413,024 acres near Quincy (state 24, 89)	Feather Falls; historic mining area; lumbering and hydroelectric developments; mountain valleys; winter sports areas
San Bernardino National Forest (established 1893)	812,633 acres near San Bernardino (U.S. 60, 66, 70, 99, 395; state 2, 18, 74)	Highest mountains in state; several wild areas; historic landmarks; Big Bear and Arrowhead lakes; Mt. San Jacinto
Sequoia National Forest (established 1908)	1,182,644 acres near Porterville (U.S. 6, 395; state 190)	High Sierra wilderness area with 200 peaks over 11,000 ft.; Mineral King recreation area; lakes and river canyons; sequoias; Sequoia National Game Refuge
Shasta-Trinity National Forest (established 1905)	2,747,890 acres near Redding (U.S. 99, 299; state 36, 89, 96)	Mt. Shasta and Shasta Lake; 5 living glaciers; lava beds; extensive stands of virgin timber; wilderness areas
Sierra National Forest (established 1893)	1,411,805 acres near Fresno (U.S. 99; state 168, 180)	Several recreation, wilderness, and wild areas; Devil's Postpile National Monument; Rainbow Falls
Six Rivers National Forest (established 1947)	1,086,785 acres near Eureka (U.S. 101, 199; state 36, 96)	Giant redwood and fir forests; Klamath, Eel, and Mad rivers
Tahoe National Forest (established 1899)	1,190,264 acres near Nevada City (U.S. 40; state 20, 49, 89)	Lakes and streams, including Lake Tahoe; Donner Monument and Trail of Forty-niners; scene of gold-rush history
Anza Borrego Desert State Park	469,388 acres in Imperial and San Diego counties (U.S. 80; state 78, 79)	Includes California Painted Desert
Big Basin Redwoods State Park	11,033 acres in Santa Cruz County (state 5, 9)	*Sequoia sempervirens*
D. L. Bliss State Park	1,237 acres in El Dorado County (U.S. 50; state 89)	Lake Tahoe; Sierra Nevada
Humboldt Redwoods State Park	23,462 acres in Humboldt County (U.S. 101)	Great stands of *Sequoia sempervirens*
Mt. Tamalpais State Park	1,364 acres in Marin County (U.S. 101; state 1)	Overlooks Pacific Ocean and San Francisco Bay area
Santa Monica Beach State Park	38 acres in Los Angeles County (U.S. alt. 101)	Southern California Beach

tive authority is given to a governor, lieutenant governor, secretary of state, controller, treasurer, superintendent of public instruction, and attorney general. All are elected for four-year terms, and the governor is eligible to succeed himself.

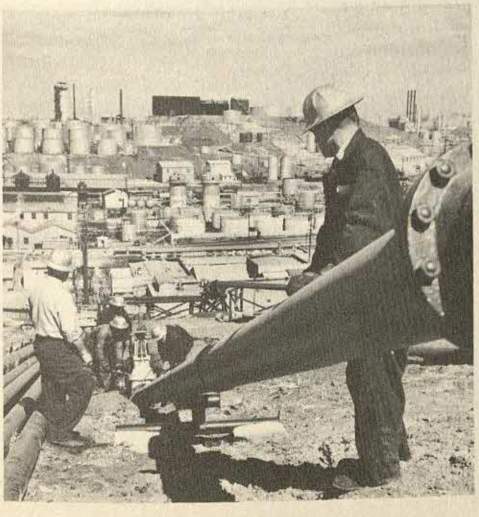
The legislature consists of an assembly of 80 members, serving two-year terms, and a senate of 40 members, serving four-year terms. The legislature meets annually, in odd-numbered years on the first Monday after the first day in January, for a session of 120 calendar days, and in even-numbered years on the first Monday in February, for a budget session of 30 calendar days. The judicial system includes a supreme court with a chief justice and six associate justices, who are appointed initially by the governor and subsequently elected and who serve for 12 years; district courts of appeal in four appellate dis-

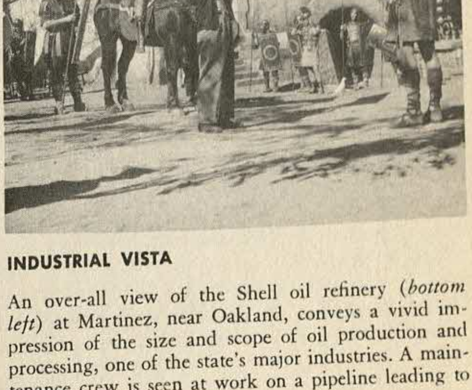




SIGHTS OF CALIFORNIA

A view of a section of San Francisco (*above*) fronting on the bay shows the famous Golden Gate, which leads to the Pacific Ocean (*courtesy Californians Inc., San Francisco*). Chinese New Year in San Francisco (*center right*) is a time of gala, colorful celebration for Chinatown's 35,000 residents. Parades with joyous participants carrying tapestries on standards and a dragon 150 ft. long make it a spectacular occasion for all San Franciscans and visitors to the city (*courtesy Redwood Empire Assn.*). A moving picture in process of being filmed (*bottom right*) is a familiar sight in Southern California. Because of Southern California's favorable climate, movie-making developed into one of the chief industries of the state (*courtesy 20th Century-Fox*)





INDUSTRIAL VISTA

An over-all view of the Shell oil refinery (*bottom left*) at Martinez, near Oakland, conveys a vivid impression of the size and scope of oil production and processing, one of the state's major industries. A maintenance crew is seen at work on a pipeline leading to lubricating-oil storage tanks

THE STARS AND STRIPES FLY OVER CALIFORNIA

A U.S. fleet takes possesssion of the territory after the 1846 revolt freed it from Mexico

tricts, each division of which consists of a presiding judge and two associate justices; a superior court in each of the counties, with the number of judges ranging from one to 90 according to population, the judges serving for six years; and various local courts. The state is represented in the U.S. Congress by two Senators and 38 Representatives.

HISTORY

Hernando de Alarcón, on an exploratory expedition up the Colorado River from New Spain in 1540, was one of the first men to come within sight of California. Juan Rodríguez Cabrillo, a Portuguese navigator in the hire of Spain, sailed into San Diego Bay in 1542. He was followed in subsequent years by many other Spanish expeditions as well as that of the Englishman, Sir Francis Drake, who landed on the coast north of San Francisco Bay in 1579.

The Jesuit missionaries were active in colonizing Lower California, but they were expelled from Spanish colonies in 1767. The Franciscans then became active in the development of the region, soon moving north into Upper California, where they established over a number of years a chain of 21 missions. When Mexico gained independence from Spain in 1822, California became a province of Mexico. In June 1846, during the war between the U.S. and Mexico, a group of American settlers, revolting against Mexican rule, declared California an independent republic under the Bear Flag. Within a month, however, U.S. naval forces arrived and raised the Stars and Stripes, proclaiming California a U.S. conquest. By the treaty of Guadalupe Hidalgo (1848), ending the Mexican War, California was ceded to the U.S.

California's first great period of development began in 1848 with the discovery of gold at Sutter's Mill, Coloma. An estimated 13,000 Europeans, of whom 7,000 were Spanish speaking, lived in California at that time. As a result of the great movement of population in 1848 and 1849, both overland and by sea, there were more than 100,000 people in California by 1850, and Anglo-Americans formed the considerable majority. California was admitted to the Union in 1850 as a free state under the famous congressional Compromise of 1850. The early days saw much turbulence and lawlessness; vigilante committees were common in the 1850's. With the completion of the Central Pacific R.R. in 1869, new settlers poured in.

California contributed 161,726 men to the armed services in World War I. The steady growth of population since 1900 was accelerated after World War II, in which 1,003,317 Californians served. Although an industrial decline was expected after 1945, the state experienced an upsurge unequaled by any of the other leading manufacturing states. Important factors in this expansion were continuations of the state's contributions to the defense economy, including the immigration to the state of former military personnel who were trained there and the tremendous expansion of shipbuilding and of the aircraft-assembly industry. The expansion of industry is continuing; in 1961 alone, $696,657,000 in new capital was invested in industrial plants. Between 1958 and 1961, manufacturing industry payrolls increased by 24 per cent. The electronics industry, only recently developed, by 1962 was one of the state's leading manufacturing employers.

See also separate entries on most of the individuals and geographical and historical subjects mentioned in this article.

California and Oregon Trail, THE, journal published by the American historian Francis Parkman (*q.v.*) in 1849, which vividly describes Parkman's exploration of the northwestern part of North America. See also *Oregon Trail.*

California, GULF OF, an inlet from the Pacific Ocean, between the Mexican states of Lower California on the west and of Sonora on the east. It is from *ca.* 50 to 140 m. in width and 740 m.

in length and covers an area of *ca.* 60,000 sq. m. The depth of the gulf ranges from 600 to 6,000 ft. The principal river that flows into it is the Colorado. There are numerous islands in the gulf, the largest of which are Ángel de la Guarda and Tiburón. Part of the gulf waters are considered unsafe because of the high and rapid tidal flows and unpredictable winds. In the safe areas, there is considerable pearl diving and deep-sea fishing, the latter for sport as well as commerce.

California, LOWER, a territory of Mexico. See *Lower California.*

California Institute of Technology, a nonsectarian private institution of higher learning, founded in 1891. It includes an undergraduate college for men, a graduate school, and an institute of research in the sciences, engineering, and the humanities. The institute is organized into the following divisions: Biology; Chemistry and Chemical Engineering; Civil, Electrical, and Mechanical Engineering and Aeronautics; Geological Sciences; Humanities; and Physics, Mathematics and Astronomy. Major off-campus facilities include the Palomar Observatory in San Diego County and the Mt. Wilson Observatory, the latter of which is operated jointly with the Carnegie Institution of Washington; the Radio Astronomy Observatory near Big Pine, Calif.; the Jet Propulsion Laboratory in Pasadena operated for the National Aeronautics and Space Admin.; and the Southern California Cooperative Wind Tunnel. The library has 115,000 volumes. The enrollment is *ca.* 700 undergraduate and 500 graduate students. There are *ca.* 450 members of the faculty. The physical plant is valued at approximately $25,000,000.

California, UNIVERSITY OF, a coeducational state institution of higher learning, founded in 1868. It has campuses at Berkeley, Davis, La Jolla, Los Angeles, Riverside, San Francisco, and Santa Barbara. Courses are offered in agriculture, architecture, business administration, chemistry, criminology, education, engineering, letters and science, law, librarianship, forestry, optometry, public health, and social welfare. Atomic and nuclear research studies are also conducted by the university in conjunction with the U.S. Atomic Energy Commission at laboratories in Berkeley and Livermore, Calif., and Los Alamos, N.M. The university's libraries have more than 4,000,000 volumes. Student enrollment totals *ca.* 43,000. There are more than 5,000 members of the faculty. The value of the physical plant has been set at $289,000,000, excluding the radiation laboratories.

California, UNIVERSITY OF SOUTHERN. See *Southern California, University of.*

Caligula (*ḳạ-lĭg′û-lạ*), popular name of GAIUS CAESAR, Roman emperor, born in Antium, now Anzio, Italy, Aug. 31, A.D. 12; assassinated in Rome, Jan. 24, 41; youngest son of Germanicus Caesar (*q.v.*) and Agrippina. Brought up among soldiers in his father's camp, he was nicknamed Caligula (from *caligae*) for the soldier's boots he wore. His great-uncle, Emperor Tiberius (*q.v.*), appointed Caligula and his grandson Tiberius Gemellus as heirs of the empire. After the death of Tiberius, with the support of the army Caligula became emperor and ruled from 37 to 41. He followed generous policies during the early part of his reign, and he was particularly approved for reversing many of the unjust policies of Tiberius. However, after a severe illness in which his mind was apparently affected, he became a tyrant, and the stories of his capricious and cruel whims are endless.

Caliph (*ḳā′lĭf*), a title of office in the Islamic faith which comes from the Arabic *ḳhalifah,* meaning "successor." The office of caliph was instituted, after the death of Mohammed, to lead the faith (see *Mohammedanism*). In theory, the caliph was to have absolute authority over secular and religious matters, as provided for in the Koranic law and Islamic tradition. Qualifications for the office were that the person be a free male adult, learned, just, and able to exercise control. Originally it was required that the caliph be a member of the tribe of Mohammed, the Koreish. Differences of opinion about qualifications brought about a schism in the faith, with the Shiites believing that the caliph must be a descendant of Mohammed, and the Sunnites believing that it was not possible to confer the office on a descendant of Mohammed. The first *caliphate* (as the rule of the caliph was called) was centered at Medina and lasted from 632 to 661. The four caliphs of this period, Abu-Bekr, Omar I, Othman, and Ali, were all contemporaries of Mohammed. This caliphate was succeeded, chiefly through force of arms, by the Ommiads, who set up their center at Damascus. From 750 until 1258, the Abbasside caliphs, recognized by the Shiites, ruled from Bagdad. During the same period, the Ommiads founded an Arab empire in Spain and initiated a caliphate at Cordova, which lasted from 756 to 1031. From 909 to 1171, the Fatimites, related to the Shiite sect, and taking their name from Fatima (*q.v.*), maintained a caliphate in North Africa, with its center in Cairo. In 1258, when the Mongols invaded the Arab lands, the Abbassides fled to Egypt, and for three centuries they maintained a caliphate there, but it was virtually without power. The Ottomans took possession of Egypt and with it the title of the caliph. They kept the title until 1924, when it ceased to exist, largely because of the growing secularization of the Islamic world and schisms in the faith. See also *Islam;* and individual articles on important caliphs and caliphates mentioned above.

Calisthenics (*kăl-ĭs-thĕn'ĭks*), the exercise of the body and limbs to promote health and grace, including the lighter forms of gymnastics, especially for girls. Many American colleges for girls give classes in calisthenics. Similar exercise is given in the U.S. military services.

Calixtines (*kȧ-lĭks'stĭnz*), the name given to the followers of Georg Calixtus, a Lutheran theologian of the 17th century. The same name refers to a sect of Hussites in Bohemia, who were so called from *calix*, the Latin word meaning cup, owing to their belief that communicants should partake of both the wine and bread in the Lord's Supper.

Calixtus (*kä-lĭks'to͞os*), the name of three popes who ruled in the period between 217 and 1458. The history of Calixtus I is obscure, but he is assigned to the bishopric of Rome, 217-23. Calixtus II succeeded Glasius II in 1119, and died in 1124. Calixtus III occupied the papal chair from 1455 to 1458. He was advanced in years and feeble. His chief object was to suppress the Turks in a crusade led by the Christian princes, but he failed for want of support. See *Pope*.

Calixtus, GEORG, theologian, born at Meelby, Germany, Dec. 14, 1586; died Mar. 19, 1656. He received a thorough education at Jena, Heidelberg, and other universities, and became acquainted with the most learned scholars of his time. In 1613 he was made professor of theology at Helmstadt, and in 1645 attended the conference of Thorn, where he had been sent by the elector of Brandenburg. He taught the doctrine of transubstantiation and embraced the philosophy of Aristotle.

Calking (*kạk'ĭng*), the process of driving a quantity of tarred oakum into the seams between the planks of ships, in order to render the joints watertight. The oakum is drawn out and laid over the seams, and is then driven by a wedge-shaped instrument called the calking-iron. When sufficient oakum is forced into the seams, it is covered with melted pitch to prevent water from getting to it. Calking is employed in making watertight the edges of both wooden planks and iron plates, and in the latter the calking-tool straddles the seam or is driven under the lap of one of the plates, depending upon the construction of the ship.

Calla (*kăl'lȧ*), a plant native to the temperate regions of most continents, found usually in the northern sections in swamps and marshes. The leaves are heart shaped, the root-stalk is creeping, and the fruit is a small red berry. It has a spreading spathe, and the oblong spadix is covered entirely with flowers. This plant is found in the northern part of Europe and North America, and the root yields a starch used as food. The beautiful calla lily, known in South Africa as the Ethiopian lily, extensively cultivated for its fine flowers, is sometimes classed with the calla, though it is a different plant.

Callao (*käl-yä'ō*), a city of Peru, of which it is the principal seaport. It is situated on Callao Bay, 7 m. w. of Lima, and is the capital of the province of Callao. The harbor is safe and spacious, and the island of San Lorenzo furnishes a natural breakwater. It has connections with the interior by several railroads, is well fortified, and carries a brisk export and import trade. The manufactures consist chiefly of ironware, clothing, leather, and sugar. Some of the streets in the older part are narrow and poorly improved, but those in the newer part are broad and cross each other at right angles. The custom house and several schools and churches are among the chief buildings. Callao is an old city, dating from the early part of the 17th century. It was destroyed several times by earthquakes and was a Spanish city until 1826. The fleet of Chile captured it in 1890. Population, *ca.* 40,000.

Calles (*käl'yās*), PLUTARCO. See *Mexico.*

Calliope (*kạ-lī'ō-pē*), in mythology, the chief of the Muses, daughter of Jupiter and Mnemosyne (Memory), who presided over eloquence and heroic poetry. She was the mother of Orpheus. The name calliope is now applied to a musical instrument consisting of a series of steam whistles, toned to the notes of the scale, and played by keys like those of an organ.

Call Money (*kạl mŭn'ĭ*), a financial term usually applied to money loaned, or at hand to be loaned as security returnable on demand of the lender. Brokers avail themselves daily of such loans.

Calms (*kämz*), REGION OF, the parts of the Pacific and Atlantic Oceans which are subject to total absence of winds for long periods of time. They are found between the region of trade winds and that of the variable winds. In the north they are known as the Calms of Cancer, and in the south as Calms of Capricorn. During former times, when navigation was carried on wholly by sailboats, these regions were dreaded by seamen as much as the regions of storms, for the reason that ships would lie at rest for several weeks, often exhausting food and water before sufficient movement of the air enabled sailing. With the introduction of large steamboats the former difficulties have been overcome. It is common for violent storms to follow calms that occur unexpectedly. See *Wind.*

Calomel (*kăl'ō-mĕl*), a compound of mercury and chlorine, known to chemists as mercury subchloride. It is insoluble in water and is blackened by ammonia. A preparation of calomel is used extensively in medicine for liver complaints, as a vermifuge, and as a purgative. It should be taken with precaution, as it is likely to produce salivation.

Calorie (*ḳăl'ō-rĭ*), a unit of heat required to raise the temperature of one gram of water from 15° to 16° C. At other temperatures, the heat-absorbing capacity of water per degree varies slightly. In terms of energy, the calorie is equivalent to 4.186 joules. The kilogram-calorie or large calorie is 1,000 times as large as the small or gram-calorie. The large calorie is used as a unit in calculating food values in terms of heat or energy productivity. See also *Agriculture:* Food and Nutrition.

Calorimeter (*ḳăl-ō-rĭm'ē-tẽr*), an instrument for measuring the amount of heat in bodies. The measurement of heat is divided into *thermometry* and *calorimetry,* the former having reference to the measurements of differences of temperature, and the latter to the quantity of heat which disappears when work is done, or develops when energy is expended. The measuring instruments are known as water, ice, or steam calorimeters. In water calorimeters, a known mass of water is used to determine the amount of heat developed or expended; in ice calorimeters, the heat of fusion of ice is the basis of measurement; and in steam calorimeters, some liquid, usually water, furnishes the heat of evaporation to determine the quantity. Electro-calorimeters are used to measure the heat generated in an electric circuit.

Calumet (*ḳăl'ū-mĕt*), a kind of pipe used for smoking tobacco by the North American Indians. The bowl was generally made of stone and the large stem was ornamented with feathers. It was the emblem of peace and hospitality. The acceptance of it was the sign of friendship and peace, and refusal was the proclamation of enmity.

Calumet City, a city of Cook County, Illinois, 20 m. s. of Chicago, on the Baltimore & Ohio Chicago Terminal and the Indiana Harbor Belt R.R.'s. Calumet City is an industrial and residential community, part of the industrial region surrounding Chicago. Its manufactures include chemicals, processed meats, and steel products. Incorporated as a village in 1893, it became a city in 1924. Population, 1950, 15,799.

Calvary (*ḳăl'vạ-rĭ*), Mount, the traditional name of the locality in Jerusalem where the Passion of Christ (*q.v.*) took place. Although there is no direct word for hill or mountain in the Bible account of the Crucifixion, tradition has made the place an elevated one. The name Calvary is taken from the Latin *"calvaria,"* a translation of the Greek *"ḳranion,"* itself a translation of the Aramaic or Hebrew for "skull." The English form Golgotha approximates the Aramaic word. Literally, then, Calvary is the "Place of the Skull."

Several sites have been accepted at various times as Mount Calvary. Recent archaeological excavations have indicated, however, that the ancient site of Jerusalem was located outside the present city wall and that, therefore, the hill now accepted as Calvary was not the place where the Passion occurred.

The name is also used to denote the little hills which in Catholic countries are crowned with one or three crosses. Along the roads to these crosses, the 14 Stations of the Cross (*q.v.*) are erected. These, in the form of statues or paintings, signify or describe the 14 stations of the sufferings of Christ. They have a devotional meaning and represent individual steps of a pilgrimage.

Calvé (*ḳăl-vā'*), Emma, soprano, born in Decazeville, France, Aug. 15, 1858; died in Millau, Jan. 6, 1942. She was educated in a convent in Montpellier, France, and in Paris. In 1882 she made her debut as *Marguerite,* in Gounod's "Faust," in Brussels. She toured in Europe and America, making her U.S. debut in 1893. Her most successful roles were those of *Carmen,* in Bizet's opera, and of *Santuzza,* in Mascagni's *"Cavalleria Rusticana."* Her autobiography appeared in 1922.

Calvert (*ḳăl'vûrt*), Cecilius, 2nd Baron Baltimore, born in 1605; died in London, Nov. 30, 1675; elder son of George Calvert (*q.v.*). He received a charter for a grant of land in northern Virginia in 1632 and was the first proprietor of Maryland, but he never visited the colony.

Calvert, Charles, 3rd Baron Baltimore, born in England, Aug. 27, 1637; died there, Feb. 21, 1715; son of Cecilius Calvert (*q.v.*). He became deputy governor of Maryland in 1661 and proprietor in 1675. His rule was harsh, characterized by oppression of the Protestants, by far in the majority in the colony. Dissension between Calvert and William Penn over Maryland's northern boundary occasioned the former's return to England in 1684, and he did not return to the colony. A Protestant revolt in Maryland (1689) overthrew the existing charter, and royal government was established in Maryland in 1692.

Calvert, George, 1st Baron Baltimore, born in Yorkshire, England, about 1580; died April 15, 1632. He was graduated from Trinity Coll., Oxford, and spent some time in foreign travel. He was a secretary of state (1619-25) under King James I and a member of Parliament (1621-24). In 1625 he was raised to the Irish peerage and given a grant of land in Newfoundland. Abandoning the Newfoundland colony in 1629, because of the severe climate and French aggression, he applied for a grant in Virginia. In 1632 King James granted him the territory which later became the state of Maryland, but Lord Baltimore died before he received the charter, and it was presented to his son, Cecilius.

Calvert, Leonard, first colonial governor of Maryland, born *ca.* 1606; died June 6, 1647; second son of George Calvert (*q.v.*). He was appointed by his older brother, Cecilius Calvert (*q.v.*), to lead the *ca.* 200 colonists who first settled Maryland in 1634. Clashing with William Claiborne (1587?-1677?), who had settled Kent Island, Chesapeake Bay, in 1631, and denied Maryland's jurisdiction, Calvert seized the island in 1638, during Claiborne's absence in England. In the recurring dispute, Calvert was forced out of Maryland in 1644, but he regained control in 1646, retaining it until his death.

Calvin (*kăl′vĭn*), JOHN, Protestant reformer, born July 10, 1509, at Noyon, in northern France; died May 27, 1564, at Geneva. Different spellings of his family name exist, and Calvin seems to be the abbreviated latinized form of a name that was variously spelled Chauvin, Cauvin, Caulvin, Cauvain, etc.

His father, Gérard Cauvin, an attorney and apostolic notary at Noyon, enjoyed the friendship of the powerful Hangest de Montmor family with whose children young Calvin grew up. His father had destined him for the priesthood and managed to get him an income from several ecclesiastical appointments in Noyon. In 1523, Calvin went to Paris to study the humanities and theology. He first studied under Mathurin Cordier at the Coll. de la Marche and went in 1526 to the Coll. Montaigu. His father changed his mind in 1527 and ordered his son to abandon theology in favor of the law. Consequently Calvin left Paris for Orléans in 1528 to study jurisprudence under Pierre de l'Estoile. From there he went to Bourges, where he remained until 1531 when his father died and Calvin returned to Noyon. The following years find him mostly in Paris, with short stays in Berry, Noyon, and Orléans. He published his first book, a commentary on Seneca's "De Clementia," in 1532 and, though greatly influenced by the Protestant leanings of his family and friends, he seems up to that time to have had more interest in the "new learning" (humanism) than in the concurrent religious revolution. A "sudden conversion" (somewhere between 1532 and 1533) changed his attitude. He again took up the study of theology and became active in the Protestant movement.

His first clash with the established authorities occurred when he helped his friend Nicolas Cop to prepare a sermon on justification through faith alone which the latter as rector of the Univ. of Paris pronounced on All Saints' Day, 1533. The ensuing vigorous opposition of both church and university made Cop and Calvin flee from Paris. The following three years were restless years. In 1534, Calvin went to Nantes, Angoulême, Saintonge, and finally to Noyon, where he surrendered his ecclesiastical benefices. He returned to Paris, had again to flee, and arrived in Basel in February 1535.

It was here that Calvin's most influential work, the "Instituto Christianae Religionis," commonly called the "Institutes," appeared, with a preface dedicated to Francis I of France (1536). From a short visit in Italy he returned to France the same year to settle his affairs in Noyon before leaving France forever. He intended to go to Strasbourg, but was stopped on his journey there by the preacher William Farel in Geneva, who implored him to strengthen the cause of Protestantism in that city.

Geneva had accepted Protestantism a year before (1535) and had just won its political independence from the House of Savoy. It needed strong guidance to defend its newly won liberties. Calvin wrote the "Articuli de Regimine Ecclesiae" (November 1536), a minute regulation of private and public morals under church discipline, which was accepted by the council; a "Catéchisme" for children (1537), and, together with Farel, a "Confession de Foy," which all citizens were expected to sign.

Calvin's violent and overbearing temper, his extremist demands, his refusal to accept a uniformity of ceremonies with Berne, and at last the Easter sermon of 1538, wherein he suddenly excommunicated his whole congregation, made any further stay in Geneva impossible. The council expelled him together with Farel. He went to Berne, from there to Basel and, finally, on Martin Butzer's insistence, to Strasbourg.

He stayed in Strasbourg as professor of theology from 1538 to 1541 and attended religious conferences in Frankfurt, Hagenau, Regensburg, and Worms, where he met most of the leaders of German Protestantism. Though he was very poor in Strasbourg, these years were on the whole quiet and happy years. In 1540 he married a widow, Idelette de Bure (Stordeur), who bore him one son in 1542. The child died shortly after his birth and no other children followed.

Meanwhile, the situation in Geneva had changed. The state of the church was deplorable; there were not enough preachers to cope with the situation, the town was torn by factional strife, and it was clear that only a man like Calvin could restore order. His party, the "Guillermins," gained the upper hand and in 1540 the first summons was sent to him to return to Geneva. But Calvin, who described himself as "timide, mol, and pusillanime," was afraid of the heavy burden that awaited him in Geneva.

He re-entered the city on Sept. 13, 1541, never to leave it again. The years in exile had broadened his mind and the contact with leading German Protestants had given him a wider view of his own problems. His character had become more mature and his political experience had grown. The city fully realized the value of his leadership and was willing to go along with him, and Calvin set to work to make it a "city of God."

To this end he presented on Nov. 20, 1541, the "Ordonnances Ecclésiastiques" to the council, providing for a complete and logical reorganization of the church in Geneva. The ordinances, after the model of the early apostolic church, created a theocratic government with four ranks of officers: the pastors, to preach and to administer the sacraments; the doctors, to educate the young; the elders, to supervise the morals of their fellow citizens; and the deacons, to take care of the poor and the sick. Supreme authority rested in the consistory, a body of 12 elders (laymen) chosen under approval of the church from the Little Council, the Council of the Sixty and the Council of the Two Hundred, and presided over by a syndic. The private life of all citizens was under strict supervision and even small breaches of discipline which we would regard today as mere nuisances or would not notice at all were severely punished. Between 1542 and 1546 alone 58 persons were executed and at least 66 banished, aside from numerous prison terms and other punishments that were meted out. No dancing, no drinking, no gambling or playing, no instrumental music, no adornment in dress, no jewelry or even plaited hair dressings for women were allowed. Attendance at sermons was obligatory.

JOHN CALVIN

Not all citizens, however, liked these stern measures, and the worldly authorities were often reluctant to carry out the demands of the pastors. The party of those that rebelled against Calvin, the "Libertines," grew, and finally came to power in 1533. Two years of arduous strife followed. Calvin was still powerful in Geneva and it was on his insistence that Miguel Servet, a Spanish doctor who held Unitarian views, was condemned and burned on Oct. 26, 1533. Though this action was approved by all the other Swiss churches and in fact by all leading Protestants, it aroused some resentment. Politically, however, it meant a victory of Calvin over his more lenient adversaries. He fought for the right of the church to excommunicate whom they wanted without consulting the council and won this fight, too. A riot caused by the Libertines and led by Ami Perrin against the steadily increasing French population, considered as a dangerous subversion against the existing authorities, led to a complete victory of Calvin's party. The cruel and bloody punishment of the participants in the revolt crushed the Libertine party forever. From now on until his death Calvin was virtually dictator of Geneva, a position which was greatly strengthened through Geneva's delicate international position (Savoy still tried to regain it), through its own want for rest and order, and through the reliable assistance of a great French refugee population.

Calvin, never a strong man, had always been a hard worker. His wife had died in 1549 and in the last, lonely years of his life, his activity rose to a feverish pitch. Altogether 59 volumes of letters and books from his pen have come to us. He preached regularly and 2,300 sermons are preserved. He advised Edward VI of England, Christian III of Denmark, and Gustav I of Sweden, and helped the Protestant cause in England, Scotland, and France. In 1559 he founded the Univ. of Geneva.

Calvin, the only Protestant leader of his time to think on an international level, did more than any other man to make Protestantism a world power. The Puritanism which played such a large part in the colonization and growth of America stems from Calvin. Lutheranism was more emotional, less preoccupied with matters of discipline and worldly administration, tending toward a religion of inner satisfaction and nothing else. Luther was convinced that once the soul was on its way to God, good works would necessarily ensue. Calvin had a more realistic view. He may have overemphasized the value of discipline, of careful organization and stringent laws, but it is safe to assume that Protestantism would not have survived the attacks of the Counter-reformation if Calvin had not instilled in his followers the need for thorough religious and civil education, for the "middle-class virtues" (Harkness) of sobriety, work, economy, and temperance, and for a sometimes narrow, but always unshakable faith.

Calvin was the first to formulate the tenets of the new faith with logic and precision. His genius for organization and leadership guided the new church through its first dangerous years. Protestantism as the world knows it today is largely Calvinism. Calvin's vitality, his worldly wisdom and strict morality, his frugality, industry, courage, and uncompromising faith (also his lack of aesthetic awareness, tolerance, and liberal thinking, his oppressive "righteousness") have left an indelible stamp on the churches which he helped to found.

Calvinism, the doctrines of the theologian John Calvin (*q.v.*). The prominent tenets of Calvinism were presented by the Remonstrance at the Synod of Dort (1618-19) in five points, embracing the doctrines of original sin, the total depravity of mankind, election or predestination, effectual calling, and final perseverance of faith. The doctrines of Calvin stand in contradistinction to those of the Lutheran and Anglican churches. The Westminster Confession of Faith, the most formal expression of the doctrines of Calvinism, is the standard of the Presbyterian churches. See also *Confessions.*

Calycanthus (*ḳăl-ĭ-ḳăn'thŭs*), a genus of shrubs native to Asia and America, with opposite leaves and purple flowers; both the bark and leaves have an aromatic fragrance. Some species are cultivated in gardens for their flowers and foliage. The genus includes six species, four of which are native to the U.S.; they are commonly known as Florida allspice, or Carolina allspice.

Calypso (*ḳȧ-lĭp'sō*), a nymph mentioned in the "Odyssey" of Homer. The daughter of the Titan Atlas, she dwelt on the wooded island of Ogygia, where Odysseus (Ulysses) was shipwrecked. Calypso offered him eternal youth if he would consent to remain with her forever. He yearned for his wife Penelope and his youngest son, however, and he begged the gods to permit him to go home. After seven years, Zeus commanded Calypso to release Odysseus. She wove the sails for him but afterward died of grief.

Calypso songs are improvised, balladlike, rhythmic chants, usually dramatizing or commenting upon various current topics. They are assumed to have originated in the British West Indies.

Calyx (*ḳā'lĭḳs*), the name applied in botany to the outermost covering of a flower, consisting of an envelope that incloses and supports the whorl of leaves known as the corolla. The leaves of the calyx are called sepals, and are either united at the margins or are separate from each other. The sepals are less delicate than the corolla and are of a greenish color. In some flowers the calyx is united with the corolla and is difficult to distinguish; the whole is called the perianth. The calyx usually falls off after flowering, but in some plants, as in the poppy, it remains until the fruit is ripe; in other plants it becomes fleshy and forms the fruit, as for instance in the rose and apple.

Cam (*ḳăm*), a contrivance for changing motion in machinery, usually consisting of a small turning or sliding piece or of a projecting part of a wheel. The shape of its face or periphery is such that it imparts or receives variable or intermittent motion by coming in contact with a rod or lever, or is in the form of a projection of some moving piece of machinery so shaped that it gives alternate motion to another piece, against which it acts. Many forms of cams and cam wheels are employed for various purposes in industrial machinery.

Camacho (*ḳä-mä'chō*), MANUEL AVILA, soldier and statesman, born in Teziutlán, Puebla, Mexico, April 24, 1897; died near Mexico City, Oct. 13, 1955. In 1914 he joined the forces revolting against the usurper Huerta. He rose from 2nd lieutenant to brigadier general, took part in the defense of Morelia (1924), and was active in the rebellion of 1927. As secretary of national defense (1937-39), he modernized the Mexican army. After suppressing the brigand Cedillo, he was made chief of staff in 1938, under Pres. A. L. Rodriguez. Backed by many conservatives, but chiefly by labor and farm workers, he was elected president of Mexico in 1940, succeeding Lázaro Cárdenas (*q.v.*), and defeating Gen. Almazán, who represented right-wing Mexico and foreign interests. Cooperating closely with the U.S., Camacho aligned Mexico against the Axis nations. He escaped death in 1944, when an army officer tried to shoot him. In 1946 he was succeeded by Pres. Miguel Alemán. See also *Mexico:* HISTORY.

Cambay (*ḳăm-bā'*), a city, gulf, and former state of northwestern India. Anciently a major trading port, the city stands at the head of the Gulf of Cambay; its harbor is now silted up. Its population is *ca.* 32,000. Still a center of trade, it was the capital of the state of Cambay (352 sq. m.; population, *ca.* 97,000), which joined Bombay state in 1948. The gulf, a portion of the Arabian Sea, is 25 m. wide and 85 m. long; it separates Bombay state from Saurashtra.

Cambodia (*ḳăm-bō'dĭ-ȧ*), French name, CAMBODGE, an independent state in southeastern Asia, lying south of Laos and Thailand and west of Viet Nam (*qq.v.*). Its area is 66,800 sq. m. Its fertile soil and tropical climate help make it a leading producer of rice; other products include corn, palm sugar, oilseeds, cotton, pepper, tobacco, coffee, cacao, plants for drugs, kapok, fibers, tea, and cinnamon. Some three quarters of the area is forested. Cattle breeding is an important industry; other industries are silk and cotton weaving, pottery, lumbering, distilling, and salting and smoking the abundant fish supply. Mining is undeveloped, but iron, gold, copper, zicrons, manganese, phosphates, and coal are found. Pnompenh (population, *ca.* 125,000), on the Mollong River, is the capital. Cambodia became a French protectorate in 1863 but was ruled by a native king. In 1887 it joined Tonkin and Annam in a customs union, the three forming a district of Indo-China (*q.v*). To settle a border dispute (1941), it ceded 16,887 sq. m. to Thailand and during the remainder of World War II was held by the Japanese. After the war France gave Cambodia internal autonomy within the French Union. In 1955, however, Cambodia seceded from the French Union. In the same year King Norodom Sihanouk abdicated in favor of his parents, Prince and Princess Suramarit, to head the Socialist People's Community party. Population, 1948, 3,748,000.

Cambon (*kän-bôn'*), JULES MARTIN, statesman and diplomat, born in Paris, France, April 5, 1845; died Sept. 19, 1935. He studied law in Paris and fought in the Franco-German War of 1870-71. He held various civil service positions in France until 1891 when he was made governor general of Algeria. Soon after he became the French ambassador to the U.S., serving from 1897 until 1902. He negotiated the preliminaries of peace which closed the war between Spain and this country. Subsequently he was ambassador to Spain (1902-07) and to Germany (1907-14).

Cambrai (*kän-brĕ'*), or CAMBRY, a city of France, in the department of the Nord, 45 m. N. of St. Quentin. It is situated on the Scheldt River, has extensive railroad connections, and is a center of trade. The manufactures include soap, leather, sugar, and machinery. The cathedral contains the remains of François Fénelon, once archbishop of Cambrai. The city was the seat of an important conference in 1508, when the League of Cambrai was organized (this included the emperor of Germany, the Pope, and the kings of Spain and France). The League's object was to disrupt the republic of Venice. Cambrai was the scene of several hard-fought battles during World War I, especially in 1918. Pop., 1946, 26,129.

Cambrian (*kăm'brĭ-ạn*), in geology, refers to a major division of time, the earliest in which clearly recognizable animal remains are now distinguishable. The Cambrian Period was so named from Cambria, the ancient Roman name for Wales, where the system of rocks that preserve the record of this age or time was first studied. The rocks of this system are immediately below those of the Ordovician System. They contain fossils of crustaceans, sponges, graptolites, cystoids, gastropods, brachiopods, and rare early cephalopods. The thickness of rocks included in this system ranges from a few feet to tens of thousands of feet, depending on their present location with reference to the ancient seaways and sources of sediments.

Cambric (*kăm'brĭk*), a very fine fabric of linen, named from Cambrai, France, where it was first made. Switzerland is now the leading center for its manufacture; cambric is also made extensively in Flanders and other countries. The name *cambric* is now applied to a fabric made of cotton in imitation of the linen product, such as Scotch cambric, which is a muslin made by twisting the cotton fibers very hard.

Cambridge (*kăm'brĭj*), county seat of Dorchester County, Maryland, 75 m. S.E. of Baltimore. It is on the Choptank River and on a branch of the Pennsylvania R.R. The surrounding country is agricultural, producing fruit, vegetables, and grain in abundance. Among the chief industries are canneries, food packing, shipbuilding, textiles, and the manufacture of wire cloth, fertilizer, ice, ice cream, bricks, and lumber. Cambridge was founded in 1684, as a trading center, and was incorporated by act of assembly in 1745. Population, 1940, 10,102; in 1950, 10,351.

Cambridge, a city in eastern Massachusetts, seat of Middlesex County, separated from Boston by the Charles River. It is served by the Boston and Maine and the New York Central R.R.'s and the Boston subway. Logan International Airport is 6 m. to the southeast. The city includes Old Cambridge, North Cambridge, East Cambridge, and Cambridgeport. It is the site of Harvard Univ., Massachusetts Inst. of Technology, and

JOHN HARVARD (1607-38)

English clergyman and founder of Harvard College, Cambridge, Mass. His statue stands in College Yard, Harvard University

Courtesy Harvard Film Service

Radcliffe Coll. (*qq.v.*). Harvard is in Old Cambridge; among its famous buildings is the Widener Library. Other historic buildings in Cambridge include Christ Church (1761); Craigie House, home of Henry Wadsworth Longfellow; and Apthorp House, famous in the Revolutionary War. A marble slab marks the site of the Washington Elm, where Gen. George Washington took command of the American army on July 3, 1775.

The diversified manufactures of Cambridge include machinery, soap, rubber goods, clothing, inks, furniture, optical goods, shoes, adhesives, valves, wire cable, caskets, and food, metal, and chemical products. It has a number of printing establishments and publishing houses.

Cambridge was founded by the Massachusetts Bay Colony in 1630. First known as New Towne or Newtown, the name was changed to Cambridge in 1638. In 1775-76 Cambridge was the headquarters of the first American army. It was chartered as a city in 1846. It is part of the Boston Standard Metropolitan Statistical Area (1960 pop., 2,589,301), which includes Suffolk County and parts of Middlesex, Essex, Norfolk, and Plymouth counties. In 1958 the city had a value added by manufacture of $183,340,000. Population, in 1940, 110,879; in 1950, 120,740; in 1960, 107,716.

Cambridge, county seat of Guernsey County, Ohio, 58 m. N. of Marietta, on the Pennsylvania and the Baltimore & Ohio R.R.'s. In the surrounding region are deposits of coal, gas, and petroleum. The manufactured products include plastics, pottery, metalware, glass, power shovels, furniture, and electric irons and motors. It was settled in 1806 and became an incorporated town in 1837. Population, 1940, 15,044; in 1950, 14,739.

Cambridge, a town of England, in Cambridgeshire, 57 m. N. of London. It is supported mainly by the great university that bears its name. King's Parade, its principal thoroughfare, is lined on both sides by many fine buildings. Besides the university, the town has a public library and the Church of the Holy Sepulchre. Cambridge is important as the market town and distributing center for the fertile agricultural area of East Anglia. Cambridge was known as *Camboritum* by the Romans. It was chartered by King John in 1201 and 1207. Population, 1948 (est.), 86,000.

Cambridge, UNIVERSITY OF, one of the two major universities of England, located at Cambridge (*q.v.*), on the Cam River. It was founded at the beginning of the 12th century. The entire university comprises 20 different corporate bodies, called colleges (18 for men and 2 for women), founded in the following order: Peterhouse, 1284; Clare, 1326; Pembroke, 1347; Gonville and Caius, 1348; Trinity Hall, 1350; Corpus Christi, 1352; King's, 1441; Queens', 1448; St. Catharine's, 1473; Jesus, 1496; Christ's, 1505; St. John's, 1511, Magdalene, 1542; Trinity, 1546; Emmanuel, 1584; Sidney Sussex, 1596; Downing, 1800. Fitzwilliam House, 1887 (known as Fitzwilliam Hall until 1924), is the center of the corporate life of noncollegiate students. The womens' colleges are Girton (founded 1869), and Newnham (founded 1871).

Each of the colleges is a self-governing body, and the control of its affairs rests with its head and fellows. Under the authority of the governing body of each college, certain officers are responsible for teaching and for the college administration. The supreme governing body of the university is the senate, which consists of doctors and masters in all faculties and bachelors of divinity. The regent house, which is a smaller body, consists of resident university and college officers, and with it the government of the university really rests. The council of the senate, the financial board, and the general board of the faculties are in the main responsible for the administration of the university. The chancellor, who is usually nonresident, is the main administrative officer of the university, and the vice chancellor, who is the main resident administrative officer, is the head of one of the colleges.

The two womens' colleges were admitted to full college status, and women were admitted to full membership of the university in April 1948, after a period of about 25 years during which they had enjoyed many, but not all, of the rights of membership.

There are about 7,200 men and 650 women students (bachelors of arts, research students, and undergraduates), in residence throughout the academic year.

The teaching staff of the university comprises about 80 professors, 45 readers, over 300 university lecturers, about 75 university demonstrators, and over 33 university assistant lecturers.

A botanical garden, an observatory, and an anatomy school are maintained by the university. The library, occupying about 28 m. of shelves, contains about 1,250,000 printed books and over 2,500 maps. The average annual increase amounts to about ⅗ of a mile of shelf-space. Each of the colleges has a library of its own, as have most of the faculties.

The university provides for the study of the liberal arts and all sciences. See also *Oxford, University of.*

Cambyses (*kăm-bī'sēz*), son of Cyrus the Great, whom he succeeded in 529 B.C. as the second King of the Medes and Persians. He invaded Egypt in the fourth year of his reign and made himself master of that country in six months. He planned to make further conquest, but the Syrians refused to aid him against the Carthaginians. The army he sent to take possession of the Temple of Jupiter Ammon perished in the desert, and one commanded by himself was compelled to retreat for want of provisions. Later he became addicted to drink and perpetrated cruelties in Egypt. He not only murdered his brother Smerdis, but also one of his sisters and his wife. He was recalled from Egypt by a revolt. While on his way to Persia he was accidentally wounded and died in 521 B.C.

Camden (*kăm'dẹn*), a city in New Jersey, county seat of Camden County, on the Delaware River, opposite Philadelphia, with which it is connected by the Delaware River Bridge, one of the longest suspension bridges in the world. It was constructed (1926) at the cost of $37,000,000, and is largely responsible for Camden's industrial and commercial growth. Camden is on the Pennsylvania-Reading-Seashore and other railroads. The principal industries include foundries, machine shops, shipyards, and railroad works. It is the home of R.C.A.-Victor, Campbell Soup, and Esterbrook Pen. There are several shipyards in the city, with dry docks and marine railways. Port Camden played an essential role in World War II. Among the principal buildings are the Broadway Stevens Building, the Wilson Building, the county courthouse, the Hotel Walt Whitman, and many schools and churches. Walt Whitman (*q.v.*), American poet, spent the last 19 years of his life in Camden, and his home is preserved as a state historic site. Cooper River Parkway in Camden covers 33 acres and is the most ambitious portion of Camden County's park system; much land in this vicinity was reclaimed from swamps.

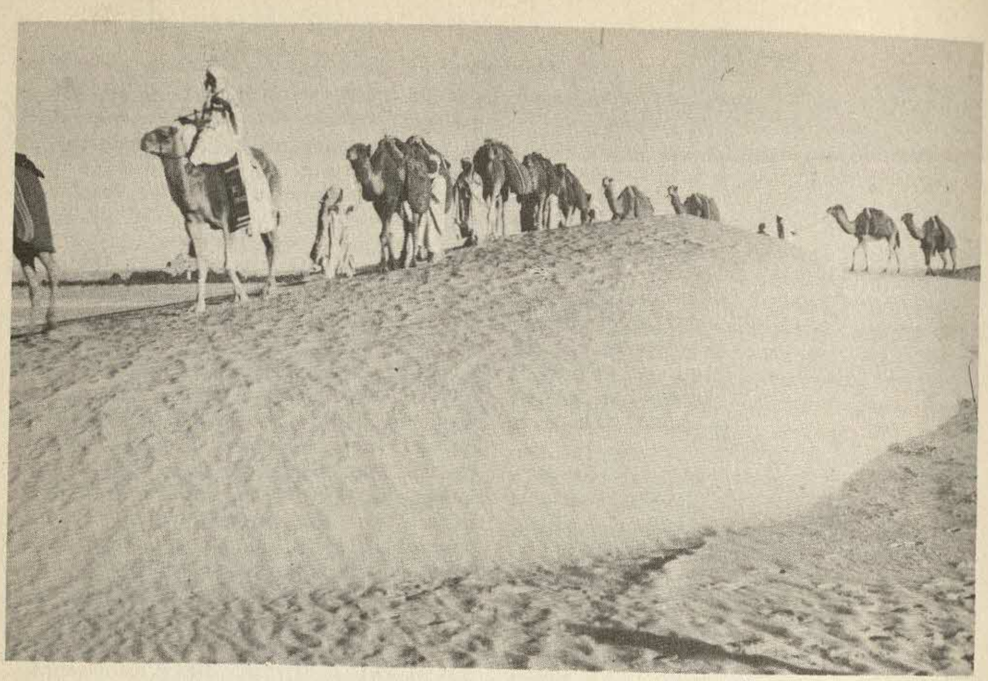
It was settled in 1773, incorporated in 1844, and is governed by a mayor and commission. Its decade of greatest growth was 1910-20—from 95,538 to 116,309. In 1950 the population was 124,555; in 1960, 117,159.

Camden, a city of South Carolina county seat of Kershaw County, 32 m. N.E. of Columbia. It is located on the Wateree River, which is utilized for navigation, and is on the Southern and the Seaboard Air Line R.R.'s. The manufactures embrace cotton and woolen goods, brick, and machinery. It is popular as a winter resort, having a pleasant and healthful climate. It has a monument erected to the memory of De Kalb for which Lafayette laid the cornerstone in 1825.

Camden is noted for two battles fought there during the American Revolution. The British under Lord Cornwallis occupied the city in June 1780, after which it was heavily garrisoned and fortified. The first engagement to take place was that on Aug. 16, 1780, in which 3,000 Americans, led by Gen. Horatio Gates, were defeated by Cornwallis and Lord Rawdon. This battle is noteworthy for the gallant stand—against overwhelming enemy fire—of the Maryland troops and the men under Baron de Kalb, despite the fact that other American forces had fled. Gen. Nathanael

SHOPPING CENTER, CAMDEN, N. J.

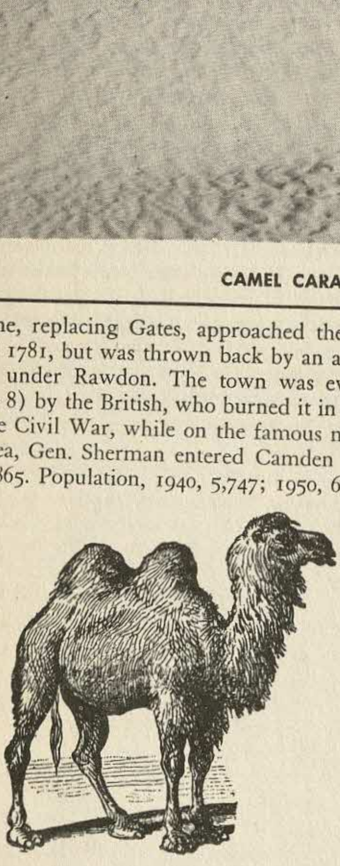
Courtesy Ewing Galloway, N. Y.



CAMEL CARAVAN CROSSING SAHARA DESERT

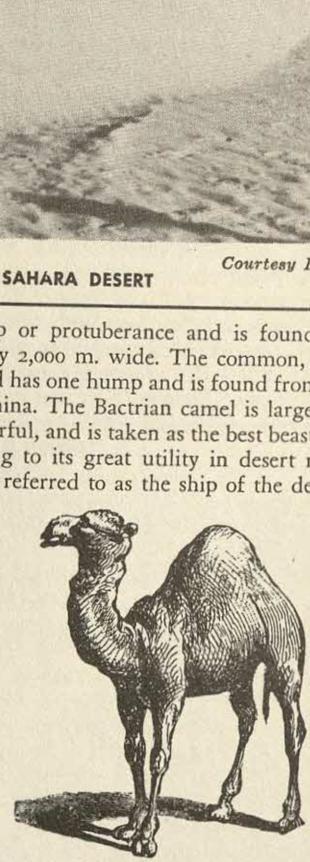
Courtesy Esso Marketer

Greene, replacing Gates, approached the city in April 1781, but was thrown back by an attacking force under Rawdon. The town was evacuated (May 8) by the British, who burned it in leaving. In the Civil War, while on the famous march to the sea, Gen. Sherman entered Camden on Feb. 25, 1865. Population, 1940, 5,747; 1950, 6,986.



BACTRIAN CAMEL

Camel (*kăm'ẹl*), a large cud-chewing animal found native in Asia and Africa. The two species are known as the Arabian camel and the Bactrian camel. They belong to the ruminant quadrupeds, and are known by their long and arched neck, absence of horns, possession of incisive, canine, and molar teeth, upper lip fissure, and one or two humps on the back. These animals are native to an extent of country from Morocco to China. The dromedary, a species of fleet camel, has a single hump or protuberance and is found in a zone nearly 2,000 m. wide. The common, or Arabian, camel has one hump and is found from Turkestan to China. The Bactrian camel is larger and more powerful, and is taken as the best beast for service. Owing to its great utility in desert regions it is often referred to as the ship of the desert.



ARABIAN CAMEL

The camel travels from three to five days without drinking and with a small quantity of food. It is capable of carrying from 700 to 1,000 pounds 25 m. a day, while those trained for speed often travel from 60 to 100 m. a day. Its power to endure thirst is due chiefly to the structure of its stomach, which is capable of draining off and storing water for future use by means of little pouches or water cells. The food is of the coarsest kind and consists of grasses, shrubs, twigs, and nettles. In a domestic state it subsists on the same general classes of foods as are fed to horses and cattle. Though appearing quite curved, the backbone is almost straight, the apparent curvature being due to its humps. These consist of accumulations of nutritious fat which is stored for future use. The owner of a camel carefully examines the humps before starting on a long journey. When they are plump and in a good condition, the animal possesses accumulated means of support and is able to endure long journeys and much exertion.

The camel lives from 30 to 50 years. It is not as intelligent as the horse or elephant, and is quite vindictive when injured. Its milk is nutritious and common food of its owner, while its flesh is highly esteemed. The hide of the camel is useful in manufactures, and the hairs serve a valuable purpose in making carpets and wearing apparel. Its nostrils and eyelashes are fitted to endure the sandstorms of the desert. The sense of smell and sight are well developed. At night and when resting it chews its cud much like cattle and sheep. The llama and alpaca of South America belong to the same genus, but have no humps. The camel is used very extensively in Eurasia, Africa, and parts of South America, and has been introduced in Australia. It is one of the most valuable animals.

Camellia (*ķȧ-mĕl'lī-ȧ*), a genus of hardy evergreen shrubs or trees native to Asia, so named from G.J. Kamel, a German missionary in the Philippines. It includes many species, of which a large number are cultivated as greenhouse shrubs. The popular camellia has beautiful, double flowers, and was originated from the camellia of China and Japan. Under cultivation it has developed red, yellow, white, and variegated colors, which differ somewhat in the form and position of the petals. These plants flower profusely in different seasons of the year. They may be propagated by layers or cuttings, and the single camellia is grown largely by planting the seed or by grafting. These plants are closely related to the tea-plant.

Camelopard (*ķạ-mĕl'ô-pärd*), another name for the giraffe (*q.v.*); also the name of a northern constellation, located near the Great Bear.

Camelot (*ķăm'ẹ-lŏt*), the legendary seat of the Round Table (*q.v.*), or court, of Arthur (*q.v.*), king of the ancient Britons.

Cameo (*ķăm'ê-ô*), the general name given to gems cut in relief, in distinction from those hollowed out like a seal. The stones used have two or more different-colored layers. The art of cutting is designed to show a layer of color with another color as a background, or an alternation of colors. In stones containing more than two colors one or more are cut so as to form ornamental wreaths or figures, as cups, flowers, or vases. Cameo cutting is of great antiquity. It was practiced by the Babylonians and from them passed down to all succeeding peoples. Some very fine specimens have been found in the ruins of Egypt and ancient Greece. Among the most celebrated cameos was the Gonzaga at St. Petersburg, which is thought to represent Ptolemy I and Eurydice. In the Marlborough collection of England is the "Cupid and Psyche," made by Tryphon, who lived in Macedon about the time of Alexander. Glass cameos are manufactured. The art of cutting cameos from shells or mollusks has long yielded excellent specimens.

Camera Lucida (*ķăm'ĕr-ạ lu'sĭ-dạ*), an optical instrument invented by W. H. Wollaston about 1812, designed to facilitate sketching objects from nature by producing upon paper a reflected picture of them. The instrument contains a glass prism of such a form that its base has the general angles of 90°, 67½°, 135°, and 67½°. The objects, placed in a horizontal direction at the proper distance from one of the planes inclosing the right angles, convey rays, which in their passage through the prism are twice totally reflected, and finally, reaching the observer's eye, placed near one of the acute angles and, looking downward, enable it to see the object of which it is in quest, on a surface placed in proper focus beneath. This camera is usually called the "clear chamber" and has undergone a number of modifications, particularly in the improvement made by the addition of a glass prism, which enables the operator to observe both the figure and the point of the pencil at the same moment and greatly facilitates sketching objects. The camera is portable and thus may be used anywhere.

Camera Obscura (*ŏb-sķū'rȧ*), an optical instrument by which the distant image of an object is thrown on a sheet of paper for convenience in sketching or for the purpose of viewing distant scenery. It was invented by Friar Bacon in the 13th century, but has been largely modified and improved. The simple form consists of a chamber from which light is everywhere excluded except at an opening about an inch in diameter, through which rays of light cast the image of the object on the opposite wall or screen. The form used for sketching usually consists of a tent surrounded by opaque curtains, at the top of which a mirror is placed in an inclined position. The light from a distant object is reflected from the mirror to the lens of a revolving lantern placed at the top of the tent, and behind it is a mirror at a slope of 45°, which transmits the image of the object to a sheet of paper placed at a suitable distance below.

Photographers employ the camera obscura, the form consisting of a box with two slides arranged to fit into each other, to one of which a tube is attached, containing an object glass at its extreme end. The camera is focused by sliding the two parts of the box and by means of moving the tube with a pinion. The image of the object is thrown on a ground glass slide in the back of the box.

When the image has been focused to its clearest and sharpest point, a sensitive plate is exposed, which receives and retains an impression of it. In recent years the kodak, an instrument constructed on this plan, has come into general use for outdoor photography. See *Photography.*

Cameron (*kăm'ĕr-ŭn*), BASIL, orchestra conductor, born in Reading, England, Aug. 18, 1885. Cameron first studied violin at the Hochschule für Musik in Berlin, Germany, and after rounding out his musical education in England became a violinist with Sir Henry Wood's Queen's Hall Orchestra. When only 28 years old, he conducted at the Wagner Centenary Festival (1913) and the following year at the Strauss Festival. Wounded in World War I, Cameron was absent from the podium for several years, but in 1928 had conducted his first concert with the Royal Philharmonic Orchestra in London. He came to the U.S. in 1930 and the reputation he established as a guest conductor brought him the conductorship of the Seattle Symphony Orchestra in 1932. Cameron returned to England in 1938, and three years later was appointed associate conductor at Albert Hall.

Cameron, JAMES DONALD, American statesman, born in Middletown, Pa., May 14, 1833. He was graduated from Princeton and entered the Middletown bank, of which he was successively clerk, cashier, and president. He was president of the Northern Central Ry. Co. of Pennsylvania from 1863 to 1874. President Grant appointed him Secretary of War in 1876, and the following year he was elected to the U.S. Senate to succeed his father, Simon Cameron. He was re-elected from time to time, serving until 1897. He died Aug. 30, 1918.

Cameron, SIMON, statesman, born in Lancaster, Pa., Mar. 8, 1799; died June 26, 1889. At the age of nine years he began to learn the printers' trade. He published a newspaper in Doylestown, Pa., beginning in 1820. He became adjutant general of the state and was elected to the U.S. Senate as a Democrat in 1845. He joined the newly organized Republican party in 1856 and was returned to the Senate. President Lincoln appointed him Secretary of War, and throughout his administration he was a supporter of the movement to arm the fugitive slaves. He was sent to Russia as minister in 1862, but resigned in the fall, and four years later was returned to the U.S. Senate, to which position he was elected a third and fourth time, but resigned in 1877 in favor of his son. He was called "The Czar of Pennsylvania Politics."

Cameron, VERNEY LOVETT, distinguished African explorer, born near Weymouth, England, in 1844; died Mar. 26, 1894. In 1857 he joined the British navy and served with distinction in the Mediterranean, in the West Indies, on the Red Sea, and on the east coast of Africa. He was appointed to command an expedition in 1872 to relieve Livingstone, and in August met Livingstone's followers bearing his remains to the coast.

Cameroons (*kăm-ĕr-ōōnz'*), a region on the west coast of Africa, located on the Gulf of Guinea and bounded on the N. by the Republic of Chad, on the E. by the Central African Republic, on the S. by the republics of Congo and Gabon, and on the W. by Nigeria and the Gulf of Guinea. It has a total area of *ca.* 200,500 sq. m. The land rises from a narrow coastal belt to a central plateau, with savannahs to the north and forests of mahogany, teak, ebony, and other valuable trees in the south. The Cameroon Mts., in the northwest, rise to 15,353 ft. at Cameroon Peak, an active volcano. Drainage is provided by four river systems, the Atlantic, the Lake Chad, the Congo, and the Niger; the Sanga, belonging to the Atlantic system, is the largest river. Rainfall is abundant throughout much of the country and particularly along the coast. Much of the soil is fertile. Agricultural products include cacao, tea, coffee, groundnuts (peanuts), millet, cotton, rice, palm products, rubber, and bananas; livestock is raised in the northern district. The population (in addition to a small representation of Europeans) is divided into two main groups, the Bantu-speaking people of the southern and central sections and the Sudanic-speaking people of the north, with the Bantu group in the majority. The population in 1959 was estimated at 6,000,000, including 4,500,000 in the former French sector and 1,500,000 in the British Cameroons.

The Cameroons region was first known to Europe through the explorations of Fernando Po in the late 15th century. This Portuguese navigator discovered the Cameroon estuary, which he named Rio das Camarões (River of Prawns). In the 17th century, Europeans established trading stations along the coast, using the commercial-minded Douala and other coastal tribes as intermediaries to barter with inland tribes for slaves, as well as for ivory, rubber, and other goods.

During this early period, the Germans, French, and British were all active in the region, but in 1884 Germany, through treaty negotiations with native chiefs, acquired control of the Kamerun, as the Germans called it. Germany thereafter extended its territorial claims inland, settling the Cameroons boundaries with adjacent French and British territories by treaties. During World War I, control of the Cameroons was divided by France and Great Britain, which in 1922 received League of Nations mandates to administer the territory. After World War II the Cameroons became trust territories of the U.N., remaining, however, under divided French and British control.

The French Cameroons, comprising the largest part of the region, became a state in 1957 but remained under French trusteeship until Jan. 1, 1960, when it gained full independence. The government of the newly established state—Cameroun—is headed by a prime minister, who is assisted by a cabinet. Legislative power is exercised by an elected assembly. The capital is Yaoundé (1955 pop., 38,000); Douala (1955 pop., 114,707) is the largest city.

Courtesy French Press & Information Service, N. Y.

VILLAGE IN THE CAMEROONS

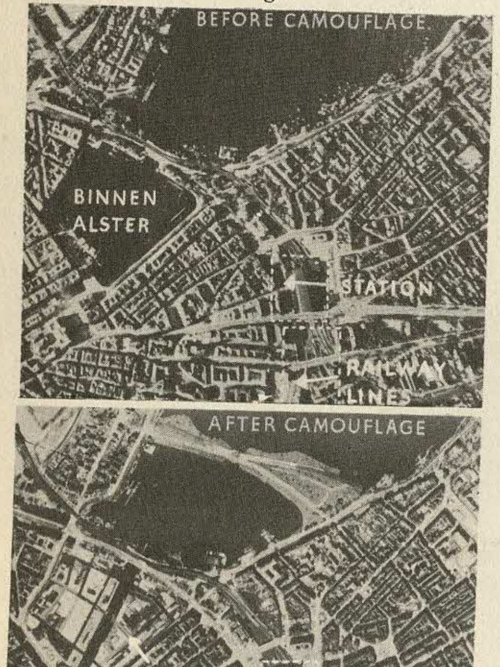
The British Cameroons, forming a strip of land along the northern border of Nigeria, has long been divided into northern and southern sections and has been administered as part of the Federation of Nigeria. The leading harbors are Victoria and Tiko. The British Cameroons is to be given a choice of joining with Nigeria (scheduled to assume independent status in October 1960) or with Cameroon. The preference of each of the two sections will be determined separately through individual plebiscites conducted under U.N. supervision.

Camillus (*kȧ-mĭl'lŭs*), MARCUS FURIUS, Roman statesman, died in 403 B.C. The place and date of his birth are unknown, but it is certain that he began a military career at an early age. He was chosen dictator in 396, at the time of the Veientine War, and captured the city of Veii by mining under its walls. For this victory he demanded a part of the spoils and became unpopular because of his pride, which caused him to retire at Ardea, but when the Gauls captured Rome, in 390 B.C., he was recalled and made dictator a second time. He rebuilt Rome and won victories over the Gauls and the Volsci. During his public career he was made dictator five times, the last appointment coming to him in 367 B.C., at a time when the Gauls invaded Rome. He defeated the invading army near Alba Longa, and subsequently erected a temple and made substantial improvements in Rome.

Camoens (*kăm'ô-ĕns*), or CAMOES, LUIS DE, eminent poet, born in Lisbon, Portugal, in 1524; died in 1579. His education was secured at the Univ. of Coimbra, where he studied advanced branches and ancient classics. He began to write poetry at an early age, and fell in love with a lady of honor, which was the beginning of his misfortunes, his marriage being forbidden by his father. He enlisted in the fleet which sailed from Portugal against Morocco, but was banished in 1556 on account of a satire written by him touching the life led by the ruling Portuguese. While in banishment at Macao, he wrote the earlier cantos of his great poem, "Lusiads." He returned to his native country in 1570 and two years later the "Lusiads" was published. This work is his greatest, containing 10 cantos, and is regarded as the national epic poem of the Portuguese.

Camomile (*kăm'ō-mīl*). See *Chamomile.*

Camouflage (*kăm'o͝o-fläzh*), a term that came into use in 1917, during the First World War, signifying the employment of methods to cover, conceal or protect against detection or observation. Those who sought to attack unobserved, or who planned to mislead the enemy, were said to make use of camouflage.



Courtesy British Information Services, N. Y.

CAMOUFLAGE BY DUPLICATION

This method of concealment found its ultimate expression in Hamburg, Germany, during World War II, where the whole of the Binnen Alster—the innermost of two lakes in the heart of the city—was camouflaged by means of huge floating rafts representing a layout of streets with a false canal running through them. A replica of Lombard Bridge, the vital road and rail connection dividing the Binnen and the Aussen Alster, was constructed about 600 yards north of the actual bridge, which was camouflaged. The railroad station and the railway lines were camouflaged by painting light-toned "roads" over them

Official U. S. Navy Photo

NET CAMOUFLAGE

A net strewn with artificial leaves camouflages a gun emplacement. As a further precaution, the gun is painted a dull color to prevent reflection of sunlight

Campagna di Roma (*käm-pä'nyä dē rō'mä*), the name applied to the plain surrounding Rome, which nearly coincides with the ancient province of Latium. It embraces the coast region of central Italy, a tract of country about 100 m. long and 30 to 40 m. wide. The northeastern part, lying on the slopes of the Apennines, is pleasant and healthful, but the lowlands are affected by malaria. Within the district are included the Pontine Marshes, formed by a number of small streams, which, having no outlet to the sea, spread over the land. The land is volcanic and a number of lakes, including Albano and Regillus, oc-

CAMOUFLAGE CLOTH

Soldiers in the field may conceal themselves with specially prepared coverings that blend in with the natural surroundings. A soldier in Alaska, for example, may protect himself with a white cloth that blends in with the snow. In jungle warfare, men wear spotted clothing to merge with sunlight and shadow

U. S. Army Signal Corps Photo

cupy the craters of volcanoes. It is certain that the plain was dry as late as 312 B.C., when the region was cultivated and the Appian Way was extended over a portion of it. The aqueducts of ancient Rome stretched across it, but the lines are now destroyed and only broken arches remain. The modern towns included in this region are Ostia, Frascati, Tivoli, and Palestrina.

Campania (*ḳăm-pä′nyä*), a portion of ancient Italy, lying S.E. of Latium, from which it is separated by the Liris River. The region was popular among the ancient Romans on account of its equable climate and great fertility. The scenery and soft sea breezes made it a favorite place for the residence of the wealthy, who erected villas of great splendor and employed slaves to cultivate the soil. Among the lakes, most of which fill the craters of extinct volcanoes, are Avernus, the fabled entrance to the lower world. Within it stands Mt. Vesuvius, near which are the buried cities of Pompeii and Herculaneum. Capua, founded by the Etruscans; Cumae, the oldest Greek settlement in Italy, and Baiae, the famous watering place of the ancient Romans, are among the noted cities. The Romans called it Felix (happy) in song and oratory, from its scenery and fertility, and it is still the *Campagna Felice* of Naples.

Campanile (*ḳăm-pȧ-nē′lē*), the name applied to a bell tower built outside many of the churches in Italy, and later extended to similar towers built in other countries. They serve the same purpose as the steeples of churches; that is, to hold the bell. The most famous are the campaniles of St. Mark's Church in Venice and the Leaning Tower of Pisa. See *Pisa, Venice.*

Campanini (*ḳăm-pä-nē′nē*), ITALO, tenor, born in Parma, Italy, in 1846; died Nov. 23, 1896. He was the son of a blacksmith and entered the army of Garibaldi, serving about two years. After the close of the war he returned to the forge, but took lessons in voice culture and studied at the Parma Conservatory. His first appearance was as the *Notary* in "La Sonnambula," and subsequently he sang with much success at Milan in "Faust." He was with the Nilsson company in America in 1873, and subsequently made a number of tours through Canada and the U.S. His voice had a large range, but became impaired from an affection of the throat.

Campanula (*ḳăm-păn′ū-lȧ*), a genus of plants found widely distributed, including nearly 300 species. The plants are mostly herbaceous and many are cultivated. The flowers are greatly variegated, including blue, white, and violet, and are favored for bordering beds. The *Bellflower* is a common species in America, growing profusely in the temperate climates, and the *Canterbury bells* is a species common to Europe. The *harebell* or Scotch bluebell is indigenous in Canada, in the United States, and in Great Britain.

Campbell (*ḳăm′b'l*), ALEXANDER, clergyman, born at Shane's Castle, Ireland, Sept. 12, 1788; died at Bethany, W.Va., Mar. 4, 1866. His education was obtained principally at Glasgow Univ. He came to America in 1809 and engaged as pastor of a Presbyterian Church in Washington County, Pennsylvania. Becoming dissatisfied with Calvinism, he and his father, also a noted minister, organized a church at Brushrun, Pa., taking the Bible as the creed. In 1827 he organized the denomination called *Disciples of Christ,* or *Christians,* formerly called *Campbellites.* See *Christians.*

Campbell, SIR ALEXANDER, statesman, born in Yorkshire, England, in 1822; died May 22, 1892. He came to Canada at an early age and was admitted to the bar in 1843. In 1856 he became queen's counsel and was a member of the legislative council of Canada. In 1867 he was made postmaster general and later minister of the interior. He was leader of the government party in the Senate, became minister of justice in 1881, and was made postmaster general a second time in 1885. Beginning with 1887, he served as lieutenant governor of Ontario.

9TH CENTURY CAMPANILE

Cathedral of Torcello, Italy

Campbell, BARTLEY, dramatist, born in Allegheny, Pa., Aug. 12, 1843; died in Middletown, N.Y., July 30, 1888. After studying law, he became a newspaper reporter. In 1868 he founded the *Evening Mail* at Pittsburgh, and later the *Southern Magazine* at New Orleans. Among his best-known plays are: "The White Slave," "Through Fire," "The Virginian," "On the Rhine," and "The Big Bonanza."

Campbell, BEATRICE STELLA TANNER, actress, born in London, England, Feb. 9, 1865; died on April 9, 1940. In 1884 she married Patrick Campbell, who died (1900) in the Boer War. She made her debut in Liverpool (1888), but her reputation was established in 1893, when she played *Paula* in "The Second Mrs. Tanqueray" in London. Mrs. Campbell played several Ibsen roles and was the original *Eliza* in Shaw's "Pygmalion." She appeared in the U.S. and in Canada on various occasions. She was married again in 1914.

Campbell, SIR MALCOLM, automobile and motor boat racer, born in Chislehurst, Kent, England, March 11, 1885; died in Reigate, Surrey, Jan. 1, 1949. He was with Lloyds of London when he engaged in motorcycle racing (1906). He took up aviation in 1909 and automobile racing in 1910. In World War I he served as a pilot. On Sept. 9, 1935, at Bonneville, Utah, his automobile set a world record of 301.13 m.p.h. in 11.955 seconds over a one-m. course. On Aug. 19, 1939, at Lake Coniston, England, his *Blue Bird II* in the unlimited hydroplane class of motor boats set a world record of 141.74 m.p.h. over a one-m. course, a record which stood until 1950. His son, DONALD CAMPBELL (1919?-), set a record of 225.36 m.p.h. in 1956, in his own *Bluebird,* a jet-propelled hydroplane, on the same lake. The older Campbell's land record was broken in 1939. The father wrote several books on racing. See also *Speed and Distance Records.*

Campbell, THOMAS, poet, born in Glasgow, Scotland, July 27, 1777; died in Boulogne, France, June 15, 1844. He was a student at Glasgow Univ. and became distinguished as a scholar of Greek literature. His poetry represents classic tendencies as opposed to the age of romanticism in which he lived. His poems include "The Pleasures of Hope," "Theodoric," "Hohenlinden," "The Last Man," "Gertrude of Wyoming," "Ye Mariners of England," and "The Battle of the Baltic." He was buried in Westminster Abbey.

Campbell, WILLIAM WILFRED, poet, born in Berlin, West Ontario, Canada, June 1, 1861; died near Ottawa, Jan. 1, 1918. He graduated from Wycliffe Coll., Toronto and the Episcopal Divinity School, Cambridge, Mass., was ordained in 1885, but retired from the ministry six years later and entered the civil service of Canada. His poetry is distinguished by his love of nature. Among his principal works are "Lake Lyrics" (1889), "The Dread Voyage" (1893), and "Beyond the Hills of Dream" (1898). He compiled "The Oxford Book of Canadian Verse" in 1906.

Campbell-Bannerman (*kăm'b'l-băn'ẽr-mạn*), SIR HENRY, statesman, born at Stracathro, Forfarshire, Scotland, Sept. 7, 1836; died Apr. 22, 1908. The youngest son of Sir James Campbell, who was Lord Provost of Glasgow (1840-43), Henry Campbell received his additional surname under the will of a maternal uncle, Henry Bannerman of Kent. He was educated at Glasgow Univ. and at Trinity Coll., Cambridge. He entered Parliament in 1868 as a Liberal, and was financial secretary to the war office (1871-74, 1880-82), chief secretary for Ireland (1884-85), and secretary for war (1886, 1892-95). A supporter of Gladstone's home-rule policy for Ireland, he advocated the administration of Irish affairs by an Irish assembly. (See also *Gladstone, William Ewart.*) He became prime minister and first lord of the treasury in 1905, as successor to Arthur James Balfour (*q.v.*). In 1907 he obtained self-government for Transvaal and the Orange Free State.

Campeche (*käm-pā'châ*), or CAMPEACHY, a seaport of Mexico, on a bay of the same name, in the northern part of Yucatan, at the mouth of the San Francisco River. The chief buildings include a college and a cathedral. It is connected by railways with interior points and has a considerable foreign trade. Population, *ca.* 17,500.

Campeche, GULF OF, the name of the southern part of the Gulf of Mexico, situated south of north lat. 21°. It is bounded by the three Mexican states of Campeche on the east, Tabasco on the south, and Vera Cruz on the west.

Camp Fire Girls (*kămp'fīr*), INC., a youth-serving organization, offering, under the guidance of trained adult leadership, many opportunities for girls of various age groups to develop talents and abilities, to give service, and to broaden horizons of interest through "learning by doing" new skills and accomplishments introduced by seven all-inclusive crafts: home craft, outdoor craft, creative arts, frontiers (of science), business, sports and games, citizenship.

The Camp Fire insigne consists of crossed logs and a flame, representing the warmth and companionship of the home fire on the hearth, and the friendship and good times found around the outdoor campfire. Four ranks: Trail Seeker, Wood Gatherer, Fire Maker, and Torch Bearer, provide definite progression in accomplishments, skills, responsibilities, and service. Girls are guided by their Camp Fire Law: "Worship God, Seek Beauty, Give Service, Pursue Knowledge, Be Trustworthy, Hold on to Health, Glorify Work, Be Happy."

This character-building organization was incorporated in 1910 and has steadily grown to a membership well over 360,000 with groups throughout the U.S. and other countries.

Camphine (*kăm'fēn*), or CAMPHENE, a purified oil of turpentine obtained by distillation over quicklime, or by rectifying it over dry chloride of lime. It forms camphor when united with oxygen. It was formerly used in lamps for lighting, but, because of its explosive gases, it was superseded for that purpose by kerosene or refined petroleum.

Camphor (*kăm'fẽr*), a translucent substance obtained from the steam distillation of wood from the camphor tree (*Cinnamomum camphora*). Camphor crystals are white or colorless and have a distinctive odor. The specific gravity of camphor is 0.99; melting point, 174-179° C. It volatilizes at room temperature and is a flammable substance. Insoluble in water, it dissolves in alcohol, ether, carbon disulfide, or naphtha. Native to Formosa, the camphor tree is cultivated in Florida and California. Synthetic camphor is made from pinene treated with acetic acid and nitrobenzene.

CAMPHOR

Camphor is used in medicine, as a plasticizer for cellulose nitrate and other explosives, in lacquers, and as an intermediate in chemical procedures. It is highly effective as a moth (or other insect) repellent.

Campignian Epoch (*ķăm-pĭn′yạn ĕp′ŏķ*), a stage of prehistoric human culture, variously regarded as a late development of the Mesolithic Period (Middle Stone Age), an early epoch of the Neolithic Period (Late Stone Age), or as a transitional period between the two. Occurring around 10,000 B.C., it is named for the village site of Campigny, France, where evidence of the culture was found. This epoch is characterized by pit dwellings, unpolished flint implements, crude pottery, and milling stones.

Campobello (*ķăm-pô-bĕl′ō*), an island in New Brunswick, Canada, near the mouth of Passamaquoddy Bay, an extension of the Bay of Fundy. It is connected by ferry with Eastport, Maine, which is 3 m. away. Campobello is *ca.* 10 m. long and 2 to 3 m. wide. It was purchased by a New York syndicate in 1880 and converted into a summer resort. President Franklin D. Roosevelt had a summer home here and was stricken with infantile paralysis during a stay in 1921. Population, 1951, 1,222.

Campoformido (*ķăm-pō-fôr′mĭ-dō*), formerly known as CAMPOFORMIO, a village in Friuli province, Italy, *ca.* 6 m. s.w. of Udine. A peace treaty between Austria and France, signed here on Oct. 17, 1797, brought to a conclusion Napoleon's first victorious Italian campaign. By the treaty's terms, the republic of Venice was partitioned between Austria and the newly created Cisalpine Republic (*q.v.*). The territories of Istria and Dalmatia went to Austria, in return for a surrender of her claims to Lombardy and the Low Countries. The Ionian Islands were given to France. There was also a secret agreement by which Austria agreed to French acquisition of the left bank of the Rhine River. In order to compensate those German princes who were to lose territory as a result of the agreement, Emperor Francis II summoned the Congress of Rastatt. A resumption of hostilities, however, cut short the work of the congress, and no concrete results were derived from it.

Campo Santo (*ķäm′pô sän′tô*), an Italian term meaning "holy field"; the term is usually applied to a burial ground. Campo Santo is used particularly to refer to a cemetery in Pisa (*q.v.*), Italy, founded in the 13th century—with earth imported from Jerusalem—and noted for its art treasures.

Campus Martius (*ķăm′pŭs mär′shĭ-ŭs*), in Italian, CAMPO MARZIO (Field of Mars) an important area of ancient Rome, located outside the city walls and situated between the Capitoline, Quirinal, and Pincian hills and the Tiber River. In earliest times it was used for popular assemblies and military exercises, and during the reign of Augustus, for chariot and horse races. It was also the site of Pompey's theater and the baths of Agrippa and Nero. Now an important quarter of modern Rome, it still contains the Pantheon (*q.v.*) and many other historic structures.

Camus (*ķȧ-mü′*), ALBERT, author, born in Mondovi, Algeria, Nov. 7, 1913; died near Paris, France, Jan. 4, 1960. He worked his way through Algiers Univ., receiving a degree in 1936.

ALBERT CAMUS

After spending several years (1935-38) as actor-director of a theatrical company, Camus worked as a journalist in Algeria and, in 1940, joined the staff of the French newspaper, *Paris-Soir*. Returning to Algeria about the time of the French defeat in World War II, he taught school for two years and completed two important works. In 1942 he went back to Paris, helped to found *Combat,* an underground paper, and served as its editor until 1945. Then a director of a French publishing house, Camus devoted much time to his writing, for which he received a Nobel Prize in 1957. In general, his work dwells on the dilemma of man in an illogical and meaningless world (a premise similar to that of existential philosophy, *q.v.*). Camus later seemed increasingly inclined toward a humanist position, suggesting that man may give meaning to life by developing a sense of his own identity in opposition to the senselessness of the world. His principal works are "The Stranger" (1946), "The Plague" (1948), "The Rebel" (1953), "The Fall" (1957), and "Exile and the Kingdom" (1958).

Camus, ARMAND GASTON, jurist, born in Paris, France, April 2, 1740; died there, Sept. 2, 1804. His training in ecclesiastical law caused him to be elected advocate general of the French clergy, and as such he was zealous as a Jansenist. He published the "Red Book," in which he gave a record of the expenditure of the court and showed the extravagance practiced in public life. In 1793 he was commissioned to capture Dumouriez and others charged with treason, but was himself made a prisoner and taken to Austria, and after about two years was exchanged for the daughter of Louis XVI. He was elected to the Council of the Five Hundred on his return to Paris and was president of that body in 1796. He subsequently devoted himself to legal literature.

Camwood (*kăm′wŏŏd*), or BARWOOD, a kind of wood used in making a brilliant red color, which, however, is not a permanent red. When prepared with the sulphate of iron, it yields the red color of bandanna handkerchiefs. The red obtained from this wood is richer than that produced by Brazil wood.

Cana (*kā′nȧ*), an ancient village of Galilee, about 6 m. N. of Nazareth, the scene of the first miracle of Jesus mentioned in John 2. It is called Cana-el-Jelil by the natives. Another village of the same name was located about 3 m. N. of Nazareth; some regard this Cana as the scene of the miracle mentioned.

Canaan (*kā′nạn*), meaning low land, a portion of the promised land of the Israelites, located between the Mediterranean and the Shur and Syrian Deserts, bordering on the Jordan River. It was so named from Canaan, the younger son of Ham (Gen. 9:18), and was occupied by the tribe which descended from him.

The Canaanites were a heathen people, and at the time of the invasion of the Israelites were divided into the four nations known as the Hivites, Hittites, Amorites, and Jebusites. It is probable that the different branches were mixed more or less with immigrants from other countries. They used the Babylonian language in diplomacy, and like the Phoenicians engaged largely in commercial pursuits. Their cities were protected by walls and fortresses, and recent research has demonstrated that they were dependents of Egypt in 1400 B.C. They worshiped Baal and Astarte. After the Israelitish invasion, they were gradually conquered, and in the reign of Solomon all paid tribute to that king.

Canada (*kăn′ȧ-dȧ*), DOMINION OF, the region which includes all of North America north of the U.S., except Alaska. The northern boundary is formed by the Arctic Ocean, Baffin Bay, and Davis Strait; eastern, by the Atlantic Ocean; southern, by the U.S.; and western, by Alaska and the Pacific Ocean. North of the mainland is the great Arctic Archipelago, containing many islands of considerable size, among them Prince Albert Land, Baffin Land, Prince of Wales Island, Southampton Island, and Melville Island, and on the west are Vancouver Island and the Queen Charlotte Islands. The most prominent coast indentations are Hudson Bay, on the north, and the Gulf of St. Lawrence, on the east. In extent it is the largest country of North America, being larger than the U.S. and almost as large as the whole of Continental Europe. The greatest length from east to west is 2,700 m. and from north to south, 1,600 m. The area is 3,847,923 sq. m.

DESCRIPTION. The surface of Canada is divided into the mountain regions of the east and of the west, and the great plain of the interior. These sections are distinguished by differences in climate, surface, and geological structure. Eastern Canada is not generally elevated, ranging from the narrow Atlantic coast plain to the highest points, which do not exceed a height of about 8,000 ft. Most of the region ranges between 1,200 and 3,000 ft., with the depression chiefly toward the shores of Hudson Bay. North of the St. Lawrence River, trending almost parallel to it, are the Laurentian Hills, which form the watershed between the basin of the St. Lawrence and the rivers which drain into Hudson Bay and Ungava Bay. The altitudes do not exceed 4,000 ft., and detached from them are buttes or summits that trend toward the west, including Mt. Royal, at Montreal, and a number of others south and west of that city. Near Niagara is the eastern extremity of a plateau, over the brink of which flow the waters from four of the Great Lakes, and thence it may be traced northward, where it finally rises and forms a series of rocky hills. The eastern shores, including the island of Anticosti, are extensions of the Appalachian Mts., ridges of which appear to be partly submerged.

In the western portion of Canada are the elevated regions of the Rocky Mts., many of which are covered with snow and glaciers. These extend into Canada from Montana, entering at the boundary between Alberta and British Columbia, whence they have a general direction toward the northwest to the vicinity of Mackenzie Bay. Immediately west of them, in Southern British Columbia, are the Gold and Selkirk ranges, and near the coast, trending parallel with it, are the Coast Mts. and the St. Elias Mts. Mt. Logan, in the southwestern part of Yukon, belonging to the range, is the highest peak, having an altitude of 19,850 ft. above the sea. Other peaks are Mt. King, 17,130 ft.; Mt. Lucania, 17,150 ft., and Mt. St. Elias, 18,008 ft. The summits of the Selkirks and Rocky Mts. are less elevated, ranging from 9,000 to about 14,000 ft. Among the highest peaks are Mts. Robson, Sir Sandford and Columbia.

The great central plain is a continuation of the plains extending northward from the U.S. It lies between the Rocky Mts. and Hudson Bay, and continues to the shores of the Arctic Ocean. A slightly elevated ridge runs almost through the center, dividing the drainage between the eastern section, which flows largely into Hudson Bay, and the western section, which drains chiefly by the Mackenzie toward the northwest into the Arctic Ocean. This region is a vast expanse of great fertility. It is covered with nutritious grasses in the southern part and with stretches of valuable forests in the northern section.

RIVERS AND LAKES. The rivers of Canada include some of the largest and most important streams of North America. In the eastern section is the St. Lawrence, which, with its tributaries, is the chief highway of commerce. It furnishes transportation facilities by way of the Welland Canal from the Great Lakes to the Atlantic. Its northern tributaries include the St. Maurice, the Ottawa, the Saguenay; and the Outarde, while those from the south are the St. Francis and the Richelieu. Hudson Bay receives all of the drainage of the southeastern part of the great central plain, including the waters from the Saskatchewan, Nelson, Churchill, Hayes, and Severn. Drainage from the western part of the central plain is carried northwest by the Athabasca, Peace, Hay, Slave, Liard, and Mackenzie Rivers. British Columbia has two river systems, the Fraser in the southern part and the Liard in the northern part, and the northwestern portion is drained into the Pacific by the Skeena and Stikine. Practically all of Yukon is in the valley of the Yukon, which rises in the southern portion and carries the drainage northwest through Alaska.

All photos in this series are N.F.B. photos, courtesy Canadian Information Service, N. Y.

SUGAR MAPLE TREES ABOUND IN ONTARIO AND QUEBEC

COAL MINING AREA IN WESTERN CANADA

Canada produces about 20 million tons of coal each year, nearly 1/3 of that produced in the United States

CANADIAN FISHERIES—A $100.000.000 BUSINESS

All parts of Canada are more or less diversified by lakes, except the regions of the far north. A great number of small lakes are found in the eastern part, including the Payne, Mistassini and St. John Lakes of Quebec. Lake Nipigon is located in Western Ontario; Lakes Manitoba, Winnipeg, and Winnipegosis, in Manitoba; Lakes Athabasca and Reindeer, in Saskatchewan; Great Bear and Great Slave Lakes, in Mackenzie; Lakes Okanogan and Kootenay, in British Columbia; and Lake

Kluahne, in Yukon. On the southern boundary are Lakes Ontario, Erie, Huron, St. Clair, Superior, and Lake of the Woods.

CLIMATE. In extent north and south, Canada lies between the north lat. 40° and the North Pole, though a large part of the southern boundary is formed by the Great Lakes and parallel 49°, the international boundary. The warmest climate is in the southwestern part at Victoria, where the temperature ranges from 34° to 60°. From the Pacific coast, modified by the warm Japan Current, the Chinook winds move eastward and temper the severity of the winter, reaching as far east as Alberta. In Saskatchewan and Manitoba, which lie a considerable distance from the sea, the climate is less equable and is marked with greater extremes. At Winnipeg and the country west and for some distance north, the climate is warm in the summer and cold in the winter, reaching from 90° in the growing season to a point as low as 50° below zero in the winter. The arid condition of the atmosphere, however, has a modifying effect and the cold appears less severe. In the southeastern part the climate is quite equable and is highly favorable to the arts of civilization, especially in all of Ontario and the larger part of Quebec, while the cold currents of the Atlantic cause Nova Scotia, part of Quebec, and all Labrador to have a damp and cold climate. The northern section of Canada has an arctic climate, with reasonably warm summers in some localities, while in others the ground remains frozen the entire year and the thermometer frequently registers 75° below zero.

The rainfall is abundant in all parts of the Dominion, except in a number of localities of the plains. The arid region is chiefly in Alberta and Saskatchewan, where irrigation is employed, and a number of sections of British Columbia have a scant precipitation. In the eastern part rain and snow are abundant, and the shores abound in fogs. The section between the Laurentian Hills and Hudson Bay has ample rainfall, but the soil is poor or rocky.

FLORA AND FAUNA. Large forests originally covered the eastern part of Canada, extending from the Atlantic through the St. Lawrence valley and most of Ontario. Large areas have been cut, but this section, especially Ontario, is still rich in timber. Manitoba has groves and belts of timber along the streams and in the vicinity of the lakes, but a large part of it and much of Saskatchewan and Alberta are comparatively treeless. However, these prairies are covered with nutritious grasses valuable for stock-raising. A belt of timber extends from Hudson Bay through the northern part of Saskatchewan and Alberta to the Rocky Mts., most of which lies north of the Saskatchewan, made up chiefly of poplar, spruce, and tamarack. Vast forests of evergreen trees, such as cedar, pine, and spruce, abound in the Rocky Mts. and the Coast Range. Along the Fraser and other valleys are large growths of the Douglas fir, which is valued for lumber and attains heights of from 200 to 300 ft.

The animals are quite similar to those of Northern Asia and Europe, and include many valuable fur-bearing species, such as the mink, sable, ermine, lynx, fox, and bear. In some sections of the Rocky Mts. the puma is still abundant, and the beaver inhabits a large part of the Dominion. The bighorn, elk, goat antelope, and pronghorn inhabit the western section, and in the Arctic region are such animals as the moose, caribou, musk ox, and white bear. Smaller game, such as the duck, goose, snipe, brant, and grouse, are abundant. Few species of the reptiles are represented, but the country is rich in birds of song and plumage. All the inland and coast waters have valuable fisheries.

MINERALS. Canada is rich in a great variety of minerals. A harsh climate and long distances work against full exploitation of her resources. Canada is the world's second largest producer of both uranium and aluminum, although, from point of value, gold production leads with nickel and copper, with Ontario the most fruitful area. The production of crude petroleum, now more in demand for fuel than coal, has increased steadily, 82,815,438 barrels being produced in 1953.

Most of Canada's aluminum comes from the Kitimat project in Vancouver. A new source of uranium has been discovered and is being developed at Beaver Lodge Lake, Saskatchewan. Because metals such as uranium and gold can be transported by air, their production is facilitated. With the building of railroad lines in the Quebec-Labrador area, other resources in iron ore, nickel, and copper are being exploited profitably.

From Lynn Lake, Manitoba, nickel and copper are mined; cobalt is also obtained here in small quantities. A large deposit of iron ore is being developed at Knob Lake, Labrador, as well as at Steep Rock Lake in Ontario. Lead and zinc are mined in the area of Great Slave Lake, Mackenzie.

Bituminous coal is mined in Alberta, Nova Scotia, and British Columbia. Most of the natural gas comes from Alberta, and new sources of petroleum have been found in Manitoba and Saskatchewan. Annual outputs are also recorded from wells in Ontario and New Brunswick. Lignite is mined in Saskatchewan and Alberta.

Other minerals produced extensively are graphite, gypsum, feldspar, sodium sulphate, barite, talc, silver from Ontario, asbestos from Quebec, and magnesium. Building stone of high quality is quarried in Nova Scotia, New Brunswick, Quebec, Manitoba, and British Columbia.

FISHERIES. Few countries are favored like Canada in the quality and quantity of its commercial fish. The Great Lakes, the interior waters, and the coasts are productive as fisheries. In a recent survey the output was valued at about $85,000,000 annually. Cod and lobster are the most important fisheries of the eastern coast, where the output is large, and in addition there are valuable catches of the hake, smelt, haddock, mackerel and sardine. Trout, pike, and pickerel are caught in the Great Lakes, and the whitefish is the most prolific in the lakes of Manitoba. Salmon fishing is of first importance in British Columbia. Pelagic sealing is a productive enterprise, and off the northern coast is the best whale-fishing region in the world. The minister of fisheries has general oversight of the fish industry, which is wisely guarded by the government.

Lumbering. Lumber has been one of the chief sources of wealth in Canada since its early settlement. Many of the forests of the eastern section have been heavily logged, but partial protection against wastage is furnished by the laws now in force. The government has reserved as public property a large area of the public domain, and lumbermen secure it by paying a license to cut. About 813,110 sq. m. are productive, about one-half containing merchantable timber. British Columbia, Quebec and Ontario have the most important lumbering industries, but timber extends across the continent in a belt ranging from 150 to 300 m. wide, and the north central section most of which is inaccessible at present, will eventually be developed when transportation facilities become available. The most important varieties of timber utilized include spruce, Douglas fir, hemlock, white pine, and many kinds of hardwoods.

Agriculture. Agriculture is the basic industry of Canada. The extensive area of arable lands is one of the principal natural resources of the Dominion. These lands are largely responsible for sustaining the industrial and commercial life of Canada. Of the 361,000,000 acres estimated to be suitable for cultivation about 63,000,000 acres are under crop. The distribution of these lands is such that Canada possesses not an unbroken belt but a series of agricultural areas between Prince Edward Island in the east and Vancouver Island in the west, characterized by a diversity of contour, soil and climate, and by a variety of crop production. Each of the nine provinces supports agricultural development on a substantial scale.

LOGGING IN BRITISH COLUMBIA

Canada produces about five billion ft. of lumber each year, approximately 15% of the quantity produced in the U.S.

It is in the principal grain crops, especially wheat, that agricultural progress in Canada has been most remarkable. Sixty years ago, that is in 1886, the wheat crop in Canada was about 25,000,000 bushels, and imports of wheat and flour exceeded exports by nearly 9,000,000 bushels. The home production of wheat in those times did not suffice for domestic requirements. Afterwards, a gradual increase in production became apparent, and exports began to exceed imports; yet it was not until 1898 that the wheat yield exceeded 50,000,000 bushels, and exports reached what was then the record total of 24,500,000 bushels. Thirty years later the Canadian wheat crop in one season totaled 566,000,000 bushels.

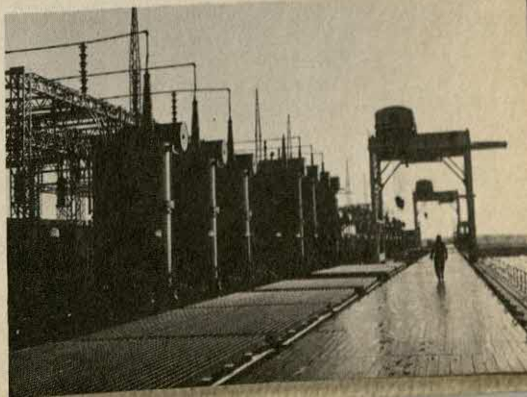
With the completion of the Canadian Pacific R.R.'s transcontinental line in 1887, linking the east and west, the Dominion for the first time was made an economic unit and the great fertile prairie lands of the Middle West were opened up for settlement. The prairie provinces —Manitoba, Saskatchewan and Alberta—have since gradually come to produce all but a small percentage of the wheat grown in Canada, and they also produce the larger percentage of oats, barley, rye, and flax, and are important in the production of dairy products, live stock, poultry and honey.

In 1890 the area under field crops in Canada was less than 16,000,000 acres. Now it is about 63,000,000. The production of better varieties of grain and improvement in the methods of cultivation have been of great importance.

Keeping pace with production have been the

HYDRO-ELECTRIC POWER PLANT

Canada has an effective electrical capacity of more than nine million h.p., representing an increase of over two million in the last decade



efforts to market to the best advantage the increasing volume of Canadian wheat, much of which goes to other countries. It is in the production of wheat for export that Canada has made the greatest and most spectacular progress. Other branches of Canadian agriculture are also attaining considerably greater importance. Canada is able to produce the grains and fodders which are important essentials of an important livestock industry, economically and in large quantities.

Dairying is one of the most important branches of Canadian agriculture. The raising of livestock has made substantial progress, not only in point of numbers, but by improvement of breeding stock.

The climate and soil of some parts of Canada are particularly well suited to commercial fruit growing, the principal districts being the Annapolis Valley, Nova Scotia; the Niagara Peninsula, Ontario; and the Okanagan Valley, British Columbia, though there are several other districts where apples and other small fruits are grown extensively for the commercial markets.

MANUFACTURING. The manufacturing industries of Canada are concentrated largely in the provinces of Ontario and Quebec. Ontario is the dominant manufacturing province, with almost half of the entire output of Canada coming from this province. Quebec, producing about 30 per cent of the total Canadian output, ranks second, and British Columbia ranks third. A prominent feature of Canadian manufacturing development in recent years has been the growth of nonferrous smelting and refining. Based on mineral resources, this has become the leading industry, along with the following, in order of their importance: chemical products, slaughtering and meat packing, shipbuilding and repairs, iron and steel products, automobiles, pulp and paper, aircraft, electrical apparatus and supplies, and primary iron and steel.

TRANSPORTATION. The Great Lakes and the St. Lawrence River are important as natural highways, and a system of canals now makes it possible for ships to pass from the head of the Lakes to the Atlantic. The smaller canals have a minimum of 14 ft. of water on the sill of the locks. Vessels from Montreal to Port Arthur pass from Lake Ontario by the Welland Canal to Lake Erie, thence by the Detroit River and St. Clair Lake and River to Lake Huron, thence by a ship canal along the bank of the St. Mary's River into Lake Superior. Navigation by water is also possible for long distances on many of the principal rivers of Canada including the Fraser, Thompson, Athabaska, Yukon, Mackenzie and Saskatchewan. Transportation is important on the lakes in Manitoba with which Winnipeg is connected by the Red River.

The Canadian Pacific Ry. has been operated as a transcontinental line since 1887, having its eastern terminus at St. John, New Brunswick, and its western at Vancouver, British Columbia. The Canadian National Ry. extends from Portland, Me., and Halifax and Sydney, Nova Scotia, to Vancouver and Prince Rupert, British Columbia, on the Pacific coast. This railway has many branches. Other transportation lines include the Pacific Great Eastern, the Vancouver & Lulu Island Ry., the Ontario Northlands Ry., the Algoma Central & Hudson Bay, and the Great Northern Railroads, and branches of the Michigan Central, New York Central, and Delaware & Hudson.

Canada also has a well developed domestic network of scheduled air transport services as well as international services. The government-owned Trans-Canada Air Lines and the Canadian Pacific Air Lines are the chief operators.

FOREIGN TRADE. Canada has an extensive foreign trade. Exports during the calendar year 1948 amounted to $3,075,400,000 and consisted mainly of animals and animal products, lumber, cereals, dairy products, minerals, paper, and wood pulp, leather, manufactures of iron and other metals, chemicals, and fresh fish. Imports in 1948 totaled $2,636,900,000 and consisted chiefly of cotton and wool, coffee, coal, iron, machinery and petroleum.

Great Britain and the U.S. are Canada's best customers and are likewise the main source of imports. The former has a preferential tariff in its favor, goods being admitted about at one-third less tariff than the rates on imports from foreign countries. The favorable trade balance originates primarily in countries of the British Commonwealth, however, and has left Canada with a U.S. dollar shortage; this circumstance forced Canada in 1948 to restrict imports from the U.S.

EDUCATION. Public instruction throughout Canada is in a high state of development, though no centralized system of education is maintained for the whole Dominion. Each province controls its own system of schools and public instruction, and attendance is free in all the provinces, each of which has from seven to nine years of compulsory education. The minister of education and his council have general supervision; the separate schools are handled locally by trustees elected in the districts. In the rural communities the single-room rural school is common, although there is a strong movement toward the formation of larger units, municipal in the eastern provinces, but based on former inspectorates in the west. Each of these has a board of trustees to manage school administration, while the separate districts retain school boards to manage local school affairs.

In Canada there are six state-controlled universities and about 12 others enrolling 34,502 regular and 1,560 postgraduate students; these, together with many junior colleges, provide for higher education. King's Coll. (founded in 1788), which later developed into a university, was the first to be established. Dalhousie Univ., Nova Scotia, was founded in 1820; McGill Univ. was incorporated in 1821 and 1852; the Univ. of Toronto, Ontario, was founded in 1828; Queen's Univ., Kingston, Ontario, in 1841; Laval Univ., Quebec, in 1852; the Univ. of Manitoba, in 1877; and the Royal Military Coll., Kingston, Ontario, in 1874. There are many educational and scientific societies, including the Nova Scotia Institute, the Royal Society of Canada, the Natural History Society of Montreal, the Scientific and Historical Society of Winnipeg, the Canadian Institute of Toronto, and the Society of Natural History in Victoria.

Constitutional provisions guarantee rights enjoyed by religious minorities. All religious beliefs are tolerated and no state church is maintained. The province of Quebec has a large proportion of Roman Catholics, who are guaranteed the privileges enjoyed while it was a colony of France. More of the people belong to the Roman Catholic Church than to any other denomination, numbering about 4,800,000 at the last census in 1941. The second in numerical strength is the United Church, which has a membership of nearly half that number. Next in order are the Anglicans, Presbyterians, Baptists, Lutherans, Jews, and Greek Orthodox.

Population. Immigration is largest from the U.S., England and Wales, Scotland, Ireland, France, and Germany. Immigration from the U.S. may be said to date from about the beginning of the present century, when settlers were attracted by the fertile lands and vast resources of the western part of Canada. The European racial origins represented most largely among the Canadian population at the time of the 1941 census were: Germans, 464,682; Scottish, 1,403,974; Irish, 1,267,702; English, 2,968,402; and the French, 3,483,038. Of the total 9,487,808 Canadian-born population, the racial origin of 4,562,150 was British, and of 3,406,659 was French. The total number of persons of foreign birth was reported at 2,017,902. The Indian and Eskimo population was 125,521. These people are made up of the four branches known as Algonquins, Eskimos or Innuits, Huron-Iroquois, and Tinnehs or Dine Dinijes. The Chinese and Japanese numbered respectively 34,627 and 23,149 (1941 census), most of whom were in British Columbia.

Ottawa, the capital of the Dominion, is a thriving city on the Ottawa River, in Ontario. Montreal, the largest city, is at the head of ocean navigation on the St. Lawrence, in Quebec. Toronto, the second city, on the north shore of Lake Ontario, is a center of commerce and manufacture. Other cities of importance include Quebec, Hamilton, Winnipeg, Halifax, St. John, London, Charlottetown, Vancouver, Victoria, Kingston, Brantford, Brandon, and New Westminster. The population of the Dominion in 1901 was 5,371,315; in 1941, 11,506,655.

Government. For the purpose of government, the Dominion is divided into ten provinces and two territories. The following table contains a complete list together with the total area in square miles and the 1951 population of each division.

Provinces and Territories	Area	Population
Alberta	255,285	939,501
British Columbia	366,255	1,165,210
Manitoba	246,512	776,541
New Brunswick	27,985	515,697
Newfoundland, including Labrador (1945 pop.)	154,734	361,416
Nova Scotia	21,068	642,584
Ontario	412,582	4,597,542
Prince Edward Island	2,184	98,429
Quebec	594,860	4,055,681
Saskatchewan	251,700	831,728
Yukon (Territory)	207,076	9,096
Northwest Territories	1,304,903	16,004
Total	3,845,144	14,009,429

The government is administered under a constitution the first draft of which is embodied in the Quebec Resolution of 1864 and the second in the London Resolution of 1866 and finally in the British North America Act of 1867, when the union of the leading colonies created a Dominion under the name of Canada, which was subsequently increased by accessions of territory.

Since the passing of the Statute of Westminster in 1931, Canada has been a fully self-governing nation, freely associated with other members of the British Commonwealth of Nations and united with them by a common allegiance to the Crown. The federal government consists of the Prime Minister and the members of his Cabinet, selected by the Prime Minister and formally appointed by the Governor General, the personal representative of the King. Even the person to fill the office of Governor General is selected on the advice of the Canadian Government, and his commission of appointment, though signed by the King, is countersigned by the Prime Minister of Canada. All the members of the Cabinet are members of one of the Houses of Parliament, usually the House of Commons. The Cabinet is responsible to the House of Commons and must have the confidence of that house. The upper house, the Senate, has 102 members appointed for life on the recommendation of the Prime Minister. The House of Commons has 262 popularly elected members. Legislative jurisdiction is divided between the provincial legislatures and the Dominion Government.

The Dominion government departments, each headed by a minister, consist of those of justice, state, trade and commerce, transport, national defense and national defense for air, fisheries, finance, agriculture, mines and resources, public works, national revenue, health and welfare, reconstruction and supply, veterans affairs, external affairs, labor and post offices.

Appellate civil and criminal jurisdiction is exercised for all parts of the Dominion by the supreme court, which has its seat at Ottawa. Suits against the Crown, or in matters of patents and copyright are heard in the exchequer court which has also general powers of admiralty. Each of the provinces has a judiciary system, including justices of the peace, police magistrates, county courts, and a supreme court, but the judges of the two courts last mentioned are appointed by the Dominion Government. All the provinces have a lieutenant governor appointed by the Dominion government, a provincial government, and an elected legislative assembly. The enactment of the Statute of Westminster which provides for full autonomy of the Dominion was one of the foremost events in the recent history of Canada.

A Parliament, consisting of two houses, the Senate and the House of Commons, has legislative authority in matters of federal jurisdiction. All bills providing for revenues must originate in the House of Commons, and the Senate may not amend these bills, but it may reject them; however it has power to initiate legislative action in many matters. Members of the Senate must reside in the province from which they are chosen, be born or naturalized subjects 30 years of age, and possess property valued at not less than $4,000. Membership in the House of Commons is based upon the population of the provinces, and the election is for five years unless the House be sooner dissolved. The Senate consists of 102 members, of whom 24 are from Quebec, 24 from Ontario, 10 from New Brunswick, 10 from Nova Scotia, 4 from Prince Edward Island, 6 from Manitoba, 6 from Alberta, 6 from Saskatchewan, 6 from British Columbia, and 6 from Newfoundland. Representation in the House of Commons is 85 members for Ontario, 75 for Quebec, 12 for Nova Scotia, 10 for New Brunswick, 14 for Manitoba, 22 for British Columbia, 15 for Saskatchewan, 4 for Prince Edward Island, 17 for Alberta, 7 for Newfoundland, and 1 for Yukon Territory.

The right to vote extends to all male and female citizens 21 years of age, but various restrictions are imposed by the provinces, such as residence for a specified time and registration on the assessment rolls. Canada has her own foreign trade and diplomatic representatives.

Literature. Canadian literature has not gained foreign notice or attention to an appreciable extent. Nevertheless, noteworthy writing achievement is seen in a vast accumulation of Canadiana which has grown throughout the years. Because Canada is a nation of two distinct cultures, French and English, her literature has been produced in two languages from the earliest times to the present; the French to meet the reading habits of Quebec and the English for the remainder of the country. The earliest Canadian literature was written in French by the first explorers, missionaries and settlers; and descendant French Canadian historians, essayists, poets and novelists have been vigorous producers during more than 300 years. At present approximately two-thirds of Canada is within the Anglo-Saxon culture sphere, and writings in the English language now form the bulk of the country's literature.

The journals and reports written by the French and English explorers of Canada are notable literary works; replete with magnificent descriptions of the newly discovered land and with stirring accounts of the incidents of pioneer life. Samuel Champlain's account of his first voyage to Canada, published in 1601, is renowned. The records of the French missionaries, *"Relations des Jesuites,"* and Lescarbot's *"Histoire de la Nouvelle France"* are notable for excellent style and content. Among English-language pioneer works Samuel Hearne's "Account of a Journey from Port Prince of Wales" and Alexander Mackenzie's "Voyages from Montreal" are distinguished. Much of the information contained in reports and diaries of early times in Canada were woven into historical novel form by the 19th century writer Francis Parkman. This writer produced a noted series of books for the general reader, some of the best-known titles being: "The Conspiracy of Pontiac," "Half Century of Conflict" and "Count Frontenac."

Canadians have always shown marked interest in the history and development of their country, and formal historical writing has been one of the most compelling fields for both English and French writers. Among Canada's best-known historians are: F.X. Garneau, C.P. Lucas, Abbé Faillon, G.M. Wrong, Chester Martin, Abbé Maheux, J.G. Bourinot, A.L. Burt and George W. Brown. Two noted series of historical and biographical works, written by various authors and published early in the present century, are: "Canada and Its Provinces" and "The Makers of Canada"; both well written and carefully edited reference works of importance. Present-day political figures in Canada are notably unproductive in the literary field, but many Canadian statesmen of earlier times were prolific and able literary craftsmen and their works have an important place in Canadiana. In this group of authors were such colorful figures as Sir Joseph Pope, Sir Wilfrid Laurier, Sir Richard Cartwright and Joseph Howe.

Although Canadian novelists have rarely gained widespread fame, they have been numerous; and the Canadian novel, generally speaking, has been vigorous, elemental and adventurous. Writers have used the background, events and people of their own country in creating their tales, and have not ventured frequently into cosmopolitan or sophisticated fiction. This peculiarity

Courtesy Bettmann Archive, N. Y.

SURRENDER OF QUEBEC, 1629

Adm. Kirke defeated the French under Champlain in one of the first clashes between England and France in the Western Hemisphere

has resulted in fictional treatment of themes on the grand scale—such as, the exploration of the wilderness, wresting the country from the Indians, the long French-English struggle for supremacy, fur-trading adventure, settlement of the prairies, building great railways, and man's struggle against climate, rivers, forests and mountains. Quite recently there has become evident a tendency for Canadian novelists to deal with more subtle human relationships and philosophical problems; one of the favored themes being the temperamental variance between citizens and institutions of the two dominant cultures in Canada.

Among the few Canadian novelists whose work has gained international attention are: Sir Gilbert Parker ("Seats of the Mighty"), Stephen Leacock ("Sunshine Sketches"), L.M. Montgomery ("Anne of Green Gables"), Robert W. Service ("Trail of '98"), Mazo de la Roche ("Whiteoak Chronicles"), Gwethalyn Graham ("Earth and High Heaven"), and Hugh MacLennan ("Two Solitudes"). The works of Stephen Leacock and Mrs. L.M. Montgomery are particularly well known to foreign readers, their books having had wide sale in the U.S. and the United Kingdom and having been translated into many languages. Leacock is universally regarded as an outstanding humorist, although his academic work in economics and history is also noteworthy. Mrs. Montgomery's novels about the adventures of Anne, who lived at Green Gables, Prince Edward Island, are a delight to the children of many countries. Canadian fiction writers whose work is highly regarded by the critics and reading public in Canada are numerous, including: William Kirby ("The Golden Dog"), T.C. Haliburton ("Sam Slick"), Frederick P. Grove ("The Master of the Mill"), Philippe Panneton (*"Trente Arpents"*), Ralph Connor ("The Sky Pilot"), J.F. LeRossignol ("The Flying Canoe"), Frederick Niven ("Mine Inheritance"), Roger Lemelin (*"Au Pied de la Pente Douce"*), Nellie McClung ("Sowing Seeds in Danny"), and Grace Campbell ("Thorn-Apple Tree").

Canadian poetry and *belles lettres* are substantial in both volume and quality, even though little known to the world's anthologists. In both the English and the French languages, from the earliest times, Canadian poets and essayists have been prolific. Earlier Canadian poets employed variations of the local scene frequently as their theme; extolling the virtues and vigor of the countryside and praising the stoicism of the pioneers. And, like poets everywhere else, Canadian lyricists have written extensively of young love, of the wonders of nature and of religious faith. A vigorous school of modernist verse, with a somewhat morbid point of view, has thrived in Canada during the past decade and has attracted some of the country's most able young writers.

The earliest Canadian poetry was in the form of unwritten Indian lore and French Canadian folksongs. Much of this material has been collected and published by Canadian ethnologists and thus preserved for posterity. "Songs of the Haida," collected and translated by Hermia Fraser, and "Songs of the Coast Dwellers," by Constance Skinner, are notable. Many students have undertaken the collection of early French Canadian folksongs, and have recalled numerous lyrics of Old France which were lost to the original country for two centuries or more. Marius Barbeau and William McLennan are two of the best known workers in this field of Canadian literature.

The pioneer life in Canada and the beginnings of a native tradition were treated by a large number of poetically inclined Canadian writers, some of them poorly schooled and isolated, but moved by a deep subjective consciousness. Known for their verses about early Canada are: Susanna Moodie, Oliver Goldsmith, Charles Heavysege, Charles Sangster and Charles Mair. With the beginning of a period of rapid development of the country, in the middle of the 19th century, a new surge of nationalistic feeling was seen in Canadian

Courtesy Metropolitan Museum of Art, N. Y.

CAPTURE OF QUEBEC BY THE ENGLISH, 1759

writing, and among the better-known poets of this period were: Isabella Crawford ("Malcolm's Katie"), William H. Drummond ("The Wreck of the Julie Plante"), Sir C.G.D. Roberts ("The Solitary Woodsman"), Archibald Lampman ("Heat"), Wilfrid Campbell ("The Winter Lakes"), Bliss Carman ("A Northern Vigil"), Frederick G. Scott ("The Unnamed Lake"), E. Pauline Johnson ("Shadow River"), and Duncan C. Scott ("Night Burial in the Forest").

Poetry in a more cosmopolitan vein, both romantic and sophisticated, has marked the work of Canadian versifiers since the beginning of the present century. Among early writers in this new spirit were: Tom McInnes ("The Tiger of Desire"), John McCrae ("In Flanders Fields"), Alfred Desroches (*"A l'ombre de l'Orford"*), Louis Dantin (*"Contes de Noel"*), Robert W. Service ("The Spell of the Yukon"), A. M. Stephen ("Voices"), Paul Morin (*"Poèmes de Cendre et d'Or"*), Marjorie Pickthall ("Resurgam"), and Audrey Brown ("The Log of a Lame Duck").

At the present time poetical writing is thriving throughout Canada; and the number of anthologies, collections and pamphlets being published indicates a surprisingly large market of poetry-lovers in Canada, as well as a large colony of eager verse writers. Among modern Canadian poets devoted to traditional and more unsophisticated forms are: E.J. Pratt, A.S. Bourinot, Leo Cox, Watson Kirkconnell, Raymond Knister, Guy Sylvestre, Frederick B. Watt, Earle Birney, Charles Bruce, Dorothy Livesay and Anne Marriott. The new school of young, experimental, and perhaps political, poets in Canada includes: F.R. Scott, A.J.M. Smith, L.A. Mackay, Leo Kennedy, Neil Tracy, A.M. Klein, Ralph Gustafson, James Wreford, Patrick Anderson, P.K. Page and Ronald Hambleton.

Belles lettres have always been a traditionally popular literary form in Canada, and much writing of this character has been produced in both permanent and temporary format. Among Canadian essayists and critics whose work is highly regarded are: W. H. Blake, Georges Bouchard, Lorne Pierce, Claude Melancon, W.A. Deacon, L. de Montigny, Dan McCowan and Bruce Hutchison. Periodical publications of high literary quality provide a medium for much of Canada's critical and interpretive writings; quarterly journals published by McGill, Dalhousie, Toronto and Queen's universities being outstanding. Publications such as *The International Journal, Saturday Night, Culture* and *Gants du Ciel* present Canadian comment on current political, economic and cultural matters, and some of Canada's best incidental writing is found in these papers.

Canadian writers maintain a number of effective craft organizations, the two most successful being The Canadian Authors' Association and La Société des Ecrivains Canadiens. See also: *American Literature:* CANADIAN LITERATURE.

HISTORY. The Norsemen were the first to visit the eastern coast of Canada. Leif Ericson came across from Greenland in the year 1000, and is thought to have touched the shores of Newfoundland and Nova Scotia. John Cabot, a Genoese by birth and an Englishman by residence, sailed from Bristol and in 1497 landed on the coast of Labrador, claiming that district for England. Basque and Breton fishermen established cod fisheries off Newfoundland in 1504, and Jacques Cartier, the French navigator, came to Quebec in 1534 and took possession of the country for Francis I, King of France. He made a second voyage in 1535 and ascended the St. Lawrence as far as Montreal.

Trading with the Indians was carried on and various attempts at settlement were made but did not prove successful until Samuel Champlain made his first voyage to Canada in 1603, sailed up the St. Lawrence under the direction of De Chaste, and in 1608 founded the first permanent settlement in Canada, at Quebec. A few years later he discovered Lakes Champlain, Huron, and Ontario, and in 1611 planted a settlement at Montreal. He concluded a treaty with the Hurons and Algonquins, which ultimately brought the French into conflict with the Iroquois, who formed alliances with the Dutch and afterward with the English.

The Jesuits and other religious orders came from France, did a great deal of missionary work and had as well great influence in secular affairs at Quebec. In 1627 the Company of New France was organized by Richelieu and held sway until 1663, when it was superseded in control by the government of France, though a new corporation, known as the Company of the West, was established in 1664, and, like its predecessor, exercised a monopoly over the fur trade. Louis XIV, and his minister, Colbert, looked upon New

France as a valuable possession and sought to establish a permanent foothold on the St. Lawrence and the Great Lakes. Frontenac was sent to America in 1672 and gave new life to the enterprise of strengthening the colony. He co-operated with La Salle in exploring the Mississippi and some of its tributaries, and in the establishment of military posts at Niagara, Mackinac, and within what was to become the territory of the U.S.

The settlements of the English in New England, New York and Virginia, as well as tension in Europe, caused a feeling of rivalry between England and France, and subsequently caused the so-called French and Indian Wars. The first clash took place as early as 1629, but France continued to retain a strong foothold until 1759, when Wolfe captured Quebec. The Treaty of Paris in 1763 ceded Canada, including all the territory between the Alleghenies and the Mississippi, to Great Britain, retaining only the city and district of New Orleans. From 1760 to 1764 Canada was entirely under military control, and in the latter year a provisional government was organized, which remained in force until 1774, when the Quebec Act was passed by the British Parliament. This legislation recognized the civil laws and institutions of the French in Canada, and provided that the Roman Catholics should exercise their religious practices without interference.

The American colonies that declared independence from England in 1776 tried to form an alliance with Canada, but it remained loyal throughout, and many loyalists left the U.S. during the Revolution. The number of immigrants from the U.S. within this period aggregates between 30,000 and 40,000, and these people not only founded New Brunswick and settled large parts of Ontario, but their descendants continue to constitute an influential element in the commercial and political affairs of the Dominion. The area of Canada was reduced by the Treaty of 1783, when the British relinquished their claims to the region now included in the states of Ohio, Indiana, Michigan, Illinois, and Wisconsin.

Though loyal to the British crown, these settlers wanted to manage their own affairs, and, in 1791, with the passage of the Constitutional Act, representative government in Canada began. Two provinces, Upper and Lower Canada, the former largely English-speaking, the latter French-speaking, were founded and each had a representative assembly elected by the people.

In the War of 1812 between Great Britain and the U.S., Canada was the scene of many battles.

The legislative assemblies set up in 1791 were representative but not responsible, that is, the governor and his council frequently did not follow their wishes. In Lower Canada, too, the governor and council were English and the assembly largely French, so racial antagonism was an additional factor. In 1837 under Papineau in Lower Canada and Mackenzie in Upper Canada rebellion broke out. It was largely abortive, but after 1841, when an Act of Union between the two provinces was passed, fully responsible government was soon established.

Courtesy Brown Bros., N. Y.

ARRIVAL OF LOYALISTS IN 1783

Loyal to the British Crown, about 40,000 people migrated to Canada from the United States in the years following the signing of the Declaration of Independence

The Dominion of Canada was created in 1867 by the British North America Act passed by the British Parliament, and at that time consisted of the provinces of Quebec, Ontario, Nova Scotia, and New Brunswick. Manitoba was admitted in 1860; British Columbia, in 1871, and Prince Edward Island became a province of the Dominion in 1873. Newfoundland refused to enter the union and still comprises an independent colony. The more recent accessions are Alberta and Saskatchewan, which were united as provinces of the Dominion in 1905, formed of the region formerly included in the four territories of Alberta, Assiniboia, Athabasca, and Saskatchewan. At the same time the region known as the Northwest Territories was reorganized. Later, in 1912, Manitoba and Ontario were enlarged by annexing the district of Keewatin, about equal parts to each, and the district of Ungava was annexed to Quebec. The Northwest Territories now embrace practically all of British North America lying north of north lat. 60°, excepting Yukon Territory but including Baffin Land and the Arctic Archipelago.

The Treaty of 1783 did not fix definitely the boundary between the U.S. and Canada, which was the subject of much contention for many years. However, the Ashburton Treaty, concluded in 1842, finally settled the northeastern boundary, and the northwestern boundary was finally adjusted in 1846. Treaties affecting the right of fishing in the Bering Sea and elsewhere have been the cause of some friction between the two countries.

Reciprocal trade relations were established in 1854 under which trade and commerce between Canada and the U.S. grew to much importance. The joint government did not work out well, English and French being often deadlocked. Further, in 1866 the anti-British feeling of the Northern states following the Civil War made them take steps to abrogate the reciprocity treaty, and gave a feeling of insecurity to the British settlements in North America. So, following lengthy negotiations, in 1869 the Dominion acquired the vast territory held by the Hudson's Bay Company since 1670, and this was followed by an uprising under Louis Riel in 1870, but he was defeated by a force under Sir Garnet Wolsey.

After confederation in 1867, Canadian internal policy began to reflect increasingly a growing desire for national self-sufficiency. In part, no doubt, this feeling resulted from fear of the vigorous actions that its more powerful neighbor, the U.S., was taking to solidify her position in the hemisphere. Boundary disputes involving Canada and Alaska suggested, perhaps, that the U.S. desired to infringe upon Canada's territorial rights. And to Canadians, the most disquieting sign of all must have been the indications that Great Britain, then in a position to control Canadian international affairs, preferred U.S. claims as against those of the Dominion.

The conflict, fortunately, subsided before it could become acute, but it was natural that traces of suspicion should continue to rankle in the minds of some Canadians. The Liberal government, under Prime Minister Laurier, adopted, in 1911, a policy of reciprocity with the U.S. The election of that year, however, repudiated this policy, and the Liberal government was replaced by a strong Conservative majority. After confederation, too, and especially after the completion of the transcontinental railways (the Canadian Pacific in 1887) lasting until the 20s of this century, began the expansion of the Canadian west accompanied by the increasing industrialization of the east. The new ministry, headed by Robert Borden (later Sir Robert), pursued a course of friendship and assistance toward Great Britain.

After a visit to England in 1912, Borden became convinced of the threat of German military and naval expansion and attempted to enlist Canadian support for the empire. A proposal to build warships to be placed at the disposal of the crown aroused bitter opposition. The House of Commons supported its leader, but the bill was defeated in the Liberal senate.

In 1914, when war engulfed Europe, Borden's government responded actively, and before the end of the year the first contingent of Canadian troops had landed in England.

About this first army, two things are especially noteworthy in view of other developments. First, the army consisted of volunteers only, and, second, that among the volunteers was a considerable number of French-Canadians.

Notwithstanding, the Liberal party, and especially its French element, opposed participation in the war. When, by 1916, enlistments had fallen below requirements, the issue of conscription naturally came to the fore. Opposition sentiment prevented easy adoption of the necessary measure; although the bill was passed in 1917, internal dissension, especially in the province of Quebec, rose almost to the point of civil war.

While this smoldering resentment must not be ignored as a factor in Canada's internal life, the Dominion's war history was nevertheless distinguished by the extent of its participation. Canadian contingents were conspicuous in action, especially in the second Battle of Ypres, and in the Champagne sector.

The total number of men who enlisted in Canada was 595,441; 418,052 men of the Canadian Expeditionary Forces went overseas.

The Conservative government continued in power during most of the war, opposed in many of its aims by a strong Liberal minority. Still, under the leadership of Sir Robert Borden, there was a Unionist administration from October, 1917, to July, 1920.

In 1921, post-war economic distress helped the Liberal party return to power, and Mackenzie King became prime minister.

As a nation, Canada matured rapidly in the following years. Canada signed the peace treaties as a separate nation and became an individual member of the League of Nations. In 1926 Canada and the U.S. exchanged ministers; the following year, Canada was made a member of the League of Nations Council, and, by 1928, steps had been taken to open legations in Tokyo and Paris. At the same time France and Japan sent representatives to Ottawa. Several Canadian-U.S. boards were established with the purpose of developing joint waterways, investigating smuggling, and easing other problems that arose as a result of contiguity of borders.

The election of 1930 ousted the Liberal government and installed the Conservative regime of Prime Minister Richard B. Bennett. During his administration the Statute of Westminster (1931), enacted by the British Parliament, removed the last restrictions upon Canadian self-government, and made it in all respects a co-equal member of the British Commonwealth of Nations.

Having arrived at the status of a world power, Canada inherited a legacy of international good feeling produced by years of co-operation. With regard to the U.S., this relationship was highlighted, in 1936, by President Roosevelt's visit to Canada. In August 1938, on another visit, the President pledged armed support should the Dominion's soil be threatened by any foreign power.

In view of the gathering war clouds over Europe, these visits, and others, did much to strengthen the ties between the two American nations.

With Great Britain, too, Canada had maintained cordial relations, which improved as the world outlook for peace grew darker. With the actual outbreak of war in September 1939, Canada allied herself with England and France (Sept. 10) as an active belligerent.

Remembering the struggle over conscription that had divided the country in World War I, the Liberal party which had returned to power in 1935 had pledged itself to oppose such measures. But two differences were immediately apparent: the Liberal party was now in power, and majority sentiment now favored the step.

Feeling itself bound by its pledges, however, the government introduced compulsory service by slow stages such as registration of eligible males and conscription for limited home service only. Not until the end of April 1942 did a favorable plebiscite release the administration from its promises and enable it to send drafted men overseas.

The controversy over compulsory service, however, did not reflect any important opposition to the complete prosecution of the war, for voluntary enlistments had already put a considerable army at the disposal of the Allies and in other respects the country made invaluable contributions of manpower and material. As early as 1940, a Permanent Joint Board on Defense had been established with the U.S., and large-scale cooperation had begun to turn out vital war supplies for the Allies. Numerous joint enterprises were undertaken, notable among them being the construction of the Alaska Highway, connecting the U.S. and Alaska through western Canada.

Meanwhile, Canadian military efforts were increasing rapidly. Dominion ships, planes and troops participated fully and heroically in the Dieppe raid (first large-scale rehearsal for the invasion of Europe) which took place on Aug. 19, 1942, and in numerous other land, sea and air actions. The expanding Canadian navy took a leading role in convoying munitions and supplies to Britain and other war centers; the Royal Canadian Air Force distinguished itself in the skies over many of the world-wide battlefronts.

More than 1,060,000 Canadian men—40 out of every 100 between ages 18 and 45—entered Canadian armed forces during the war. The expansion of its forces during World War II put Canada third among the United Nations in naval power and fourth as an air power; during the same period it became the fourth largest supplier of war equipment and one of the chief suppliers of food for the Allies.

Total strength of all armed forces at V-E Day was more than 741,387, of whom 706,973 were men and 34,414 were women. Greatest growth occurred in 1942 when the net increase in strength amounted to more than 227,000 including more than 15,000 women.

All members of Canada's navy and air force and, until December 1944, of its army overseas were volunteers. The army comprised general service personnel who enlisted voluntarily for service anywhere in the world as well as men called up for compulsory service, principally in Canada and adjacent territories, under the National Resources Mobilization Act. Of 696,265, the total net number of men taken into the army up to June 30, 1945, fewer than 15 per cent had failed to volunteer for general service.

Toward the close of 1944, in order to replenish the reinforcements for the overseas army, an order-in-council was passed by which authority was given to send overseas up to 16,000 of the men serving under the N.R.M.A. Troop movements began during the Christmas period, and by V-E Day 13,000 N.R.M.A. men had been sent overseas, and another 3,000 had proceeded overseas after having volunteered for general services.

Indicative of the scale on which the country mobilized for World War II was the rapid growth of the Royal Canadian Navy and Canada's merchant marine. Industries were quickly converted to production of arms and other war materials.

The domestic scene was marked also by an extensive system of price, wage, and manpower controls, and consumer rationing; these devices helped to hold down the cost of living and insured equitable distribution. During the same period a system of social security was instituted, providing unemployment insurance and family allowances, and organizing public employment offices on a Dominion-wide basis.

Like most other countries, Canada has experienced broad shifts of political opinion. The opposition between the two leading parties, Conservatives and Liberals, no longer strictly accords with their names; recognizing this, in 1943 the Conservative party changed its name to "Progressive Conservative." The Cooperative Commonwealth Federationist (Socialist) party gained prominence on the provincial level, although the Liberal party received the largest votes in recent national elections. Other recent events of major importance to the dominion included the incorporation of Newfoundland, with Labrador (*qq.v.*), as the tenth province (March 31, 1949). In October 1951 Princess (later Queen) Elizabeth and her consort, Prince Philip, visited Canada on an extended tour, and in January 1952 Vincent Massey, industrialist and prominent Liberal party member, was appointed Governor General, the first native-born Canadian to hold the office. The new Governor General succeeded Viscount Alexander (*q.v.*), who was appointed Defense Minister of Great Britain.

After the end of World War II, problems of inflation and a U.S. dollar shortage led to the reimposition of price controls on certain commodities and to the curtailment of imports. Canada's financial difficulties were eased somewhat by substantial U.S. loans, and following other countries of the British empire Canada devalued her currency by 9.1 per cent in September 1949. However, Canada's economy and foreign trade made a remarkable recovery within three years. This period was also marked by a great expansion of Canada's industry (chiefly oil and minerals). As a result of a surplus budget, the government reduced the income and certain excise taxes (1952) and the rate of exchange for the Canadian dollar exceeded the value of the U.S. dollar in the international market.

As a charter member of the U.N., Canada worked actively for world peace, generally aligning herself with the Western Powers, and taking part in technical assistance programs to underdeveloped countries, especially in Asia. In 1949 she was one of the original signers of the North Atlantic Treaty (*q.v.*) and in 1950 she sent troops to Korea (*q.v.*) to aid in the U.N. fight against Communist aggression.

Canada Balsam (*bạl'sạm*), a transparent liquid obtained from a species of fir native to Canada and the northern part of the U.S. It is resinous, has a pale yellow color and an acrid taste, and closely resembles turpentine. The name was derived from the balsam fir, from which it was first obtained, but it is likewise secured from the hemlock, spruce and other species. It has the consistency of honey when it exudes from the bark, but becomes solid after exposure to the air. This product is valuable in making varnishes, in photography, and in medicine.

Canada Goose (*ꞓăn'ȧ-dȧ gōōs*), a wild goose which inhabits North America, breeding in the north and moving southward to the warmer region in autumn. It is about 35 in. long. The plumage is gray, with black on the head and the tail. Flocks of these geese begin to move north about the first of April.

Canada Hemp (*ꞓăn'ȧ-dȧ hĕmp*), a species of herb native to America, belonging to the dogbane family. It abounds throughout the western part of Canada and the U.S., and furnishes a fiber used by the Indians in making nets and numerous articles. The bark of its root has tonic properties.

Canadian River (*ḳȧ-nā'dĭ-ạn*), a river of the U.S., 900 m. long. It rises near the line between Colorado and New Mexico, thence flows through New Mexico, Texas, and Oklahoma. It receives the North Fork of the Canadian River in Oklahoma, and flows into the Arkansas River about 50 m. w. of Ft. Smith.

Canadian Thistle. See *Thistle*.

Canal (*ḳȧ-năl'*), an artificial water course or channel. Canals were employed in antiquity. The earliest known in history were those built by the Babylonians, who utilized them for navigation and drainage. The Egyptians connected the Nile and the Red Sea by a canal at a remote period. Although it fell into decay through the fortunes of war, it was reopened by Pharaoh Necho about 605 B.C., and at intervals by others after him. Most of the ancient nations constructed canals. The great canal of China is 825 m. long. It was commenced in the 7th century A.D. and was completed in the 9th. Canals were first built in France, Germany, and England by the Romans, the canal at Caderike being the first artificial

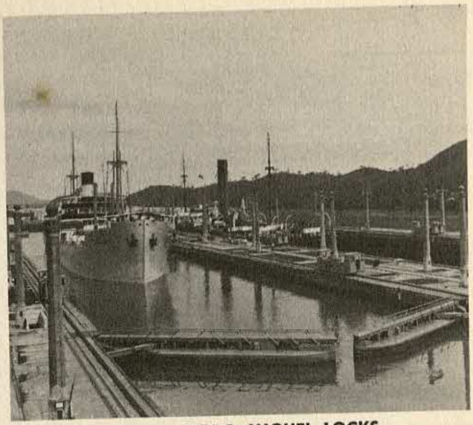
OLD CANAL IN UTRECHT, HOLLAND

The buildings along the canal were originally warehouses to which deliveries were made from barges in the canal. To facilitate the procedure, the cellars were built at water level

Official Netherlands Photo

channel used for navigation in the British Isles. The Whitham and Trent rivers were joined by a canal in 1134, and in 1759 the Bridgewater Canal was commenced. The Erie Canal of New York was begun in 1817 and was completed in eight years. Many noted canals were built in the 17th and 18th centuries in Holland, Germany, Belgium, and other countries of Europe. The construction of canals has been greatly modified since the beginning of the era of railroad building. Canals are built for boats, ships, drainage, water power, and irrigation. (See also *Aqueduct.*)

Boat and Drainage Canals. Boat canals serve for transportation purposes. The Erie Canal of New York, one of the notable artificial channels in the U.S., is 341 m. long and connects the Hudson River at Albany with Lake Erie at Buffalo. The state appropriated $9,000,000 in 1895 to deepen the canal and otherwise improve it for the use of larger vessels. It is now 12 ft. deep. Most drainage canals are constructed for sanitary and drainage purposes, but in some cases they are used partly for navigation. Many canals of this type penetrate various parts of The Nether-


PANAMA CANAL. PEDRO MIGUEL LOCKS

MAJOR RIVERS, CANALS, AND CONNECTING CHANNELS OF THE U.S.

Name	Length (m.)	Project Depth (ft.)	Linkage
Connecting Channels of the Great Lakes	1,258 1,165	27 (about) 27 (about)	Duluth, Minn., to U.S.-Canadian boundary. Chicago, Ill., to U.S.-Canadian boundary.
Mississippi River System:			
Mississippi River	1,839	9 and 12	Minneapolis, Minn., to Gulf (40-ft. channel below Baton Rouge, La.).
Ohio River	981	9	Pittsburgh, Pa., to Cairo, Ill.
Monongahela River	128	9	Fairmont, W. Va., to Pittsburgh (a channel depth of 9 ft. is available to mile 100.3—Morgantown, W. Va., 8 ft. from mile 100.3 to mile 100.9—Morgantown Bridge, and 7 ft. above mile 100.9).
Illinois Waterway	327	9	Chicago to Grafton, Ill.
Missouri River	761	9	Sioux City, Iowa, to mouth.
Tennessee River	648	9	Knoxville, Tenn., to mouth.
New York State Canal System:			
Erie Canal	341	12	Troy to Tonawanda.
Oswego Canal	24	12	Oswego to Three Rivers Point (Section of Erie and Oswego canals, Troy to Oswego, being deepened by U.S. to 14 ft.).
Champlain Canal	60	12	Waterford to Whitehall.
Cayuga and Seneca Canals	93	12	Spur channels.
Hudson River	143	32	Albany, N.Y., to New York City (Project depth is 14 ft., Albany to Waterford [Troy], 12 m.).
Cape Cod Canal	17	32	Cape Cod Bay to Buzzards Bay.
Chesapeake and Delaware Canal	46	35	Chesapeake Bay to Delaware River.
Atlantic Intracoastal Waterway	742	12	Norfolk, Va., to St. Johns River, Fla.
Gulf Intracoastal Waterway	1,125	12	St. Marks River, Fla., to Brownsville, Texas.
Sabine-Neches Waterway	58	36	Beaumont, Orange, and Port Arthur, Texas; to the Gulf.
Columbia-Willamette Rivers	113	35	Mouth to Portland, Ore.

lands. The canal which carries the surplus water from Lake Zumpango, in Mexico, was commenced in 1607. Many years were required for its construction; it was completed in 1789, after 182 years. The canal was greatly improved by an expenditure of $3,500,000 in 1889. It carries the sewage of the city of Mexico and drains the adjacent valleys. The greatest work of this sort ever attempted is the Chicago Sanitary and Ship Canal, which extends from the south branch of the Chicago River to the Des Plaines River, at Lockport, a distance of about 31 m. It was completed for the first passage of water in eight years, beginning in 1892, at a cost of $48,000,000. By means of this canal, water from Lake Michigan flows into the Chicago River and carries sewage from Chicago through the Des Plaines River to the Illinois River. The canal now provides water navigation from the Great Lakes to the Des Plaines River and forms a part of the Illinois Waterway connecting the Great Lakes with the Mississippi River.

Ship Canals. Ship canals are constructed for the passage of the largest ocean vessels. The Suez Canal, connecting the Mediterranean with the Red Sea, is the first large ship canal to be completed in modern times. It was opened in 1869, is 99 m. long, 327 ft. wide, and 26 ft. deep. The Kaiser Wilhelm (Kiel) Canal, in Germany, was opened in 1895. It connects the North and Baltic Seas, passing through Schleswig-Holstein. It affords passage for the largest vessels afloat, and its opening was one of the most important events in the commercial history of Europe. The project to cut a canal across the Isthmus of Panama, with the view of connecting the Atlantic with the Pacific, was first attempted in 1878, under the French engineer, M. de Lesseps, the builder of the Suez Canal. The work was commenced in 1881, but the company became involved in financial difficulties. In 1904 the project of constructing the canal was undertaken by the government of the U.S. It was completed in 1914 at a cost of $375,000,000. The Welland Canal of Canada connects Lakes Erie and Ontario. Important ship canals in the U.S. include the Cape Cod Canal, completed in 1914, which connects Buzzards Bay with Cape Cod Bay and shortens the shipping distance from Long Island Sound to Boston by about 70 m. The Intracoastal Waterways represent a system of canals and waterways connecting—with a few gaps—Boston, Mass., and the Rio Grande on the southern border of Texas. These are the Atlantic Intracoastal Waterway and the Gulf Intracoastal Waterway.

A canal for deep-draft ocean shipping, connecting the Great Lakes and the Atlantic, the St. Lawrence Seaway (*q.v.*) was opened in 1959.

Most of the boat and ship canals contain lift locks, by means of which navigation may be achieved through hilly terrain. A lift lock is a compartment or "chamber" containing water; vessels are floated into the chamber at one level and are raised or lowered to the other canal level by filling or emptying the chamber to the desired elevation.

Other Canals. Water-power canals are constructed to supply water power for the operation of machinery. Notable is the Sault Ste. Marie Canal, by which the water of the St. Mary's River furnishes energy equal to 51,400 horsepower.

Irrigation canals were built by the Ptolemies in ancient Egypt and have been constructed in most arid countries. The most extensive irrigation canals in the U.S. are in Colorado, Nevada, Utah, California, and Washington, where large areas of arid and desert land now support major farming and dairying enterprises. The All-American Canal (built 1934-40) comprises 80 m. from Imperial Dam on the Colorado River through the Imperial Valley, southern California, and a 130-m. branch in the Coachella Valley, is a notable irrigation project.

See also *Suez Canal; Panama Canal,* etc.

Canale (*kä-nä'lā*), ANTONIO, called CANALETTO, painter, born in Venice, Oct. 18, 1697; died there, April 20, 1768. Canaletto went to Rome in 1719 to study architecture, but on his return to Venice he devoted himself once more to painting, which he had studied earlier with his father, a scene-painter. He lived in England for a short time (1746-55). But his architectural studies were undoubtedly a factor in his choice of subject matter, the magnificent buildings and eternal pageantry of his native city. Canaletto's solidly constructed views of Venice, full of air and sparkling sunlight, gave a new importance to the subject of the city scene and created a tradition of their own, brilliantly followed by Canaletto's students, Bernardo Belotto and Francesco Guardi.

Canaletto. See *Canale, Antonio.*

Canal Rays (*kȧ-năl'*), accelerated positive ions, which pass in cylindrical bundles through a perforated cathode in a discharge tube; discovered (1886) by the physicist Eugen Goldstein.

Canal Zone (*zōn*), a tract of land extending roughly 5 m. on each side of the center line of the Panama Canal, crossing the Isthmus of Panama. The Zone comprises an area of 648.01 sq. m., of which 372.49 sq. m. are land. The Canal Zone was established in 1904; it had been granted in perpetuity to the U.S. by the Republic of Panama under their 1903 treaty. The Panama Canal Company, a government corporation under the authority of the Secretary of the Army, administers the waterway and its related enterprises. Its revenues pay the net cost of the civil government—known, since 1951, as the Canal Zone Government. Although the Company and the Government constitute separate entities, they are headed by a single individual, who has the dual title of Governor of the Canal Zone and President of the Panama Canal Company. Among the larger cities of the Canal Zone are Cristobal, the Atlantic terminus of the Canal; and Balboa Heights (government headquarters) at the Pacific terminus. Population, 1950, 52,822.

Canarsee Indians (*kạ-när′sē ĭn′dĭ-ạnz*), a group of Delaware Indians, formerly one of the leading tribes on Long Island, N.Y. They occupied most of what is now Kings County and the shores of Jamaica Bay. Their principal village probably was Canarsee near Flatlands. They are mainly of interest because the site of the City of Brooklyn was obtained from them. The last Canarsee died about 1800.

Canary (*kȧ-nâr′ȳ*), a singing bird of the finch family, native to Madeira and the Canary Islands. In the wild state, the bird builds its nest near houses and feeds on grass seeds, buds, and insects. The canary is easily tamed, thrives well in cages, and lives from 12 to 16 years in captivity. It was introduced into Europe about 400 years ago and is now extensively bred in all civilized countries. Training canaries is an important occupation in some parts of Europe, particularly in the Harz Mts. of Germany. The size of the birds has been increased by domestication; some measure 5 in. in length. While they are green or greenish-yellow in their wild state, they have been bred into several strains with different colors. The yellow birds are most popular. Selective breeding may also have improved the musical tones of the canary's voice. Depending on their song, the birds are classified as *rollers* or *choppers*. Their usual food is the seed of millet or canary grass.

Canary Grass, any one of about ten kinds of grass, all known botanically as *Phalaris* (*făl′ạ-ris*), in the grass family; specifically, the bird-seed grass, *Phalaris canariensis*. The canary grasses are widely distributed throughout the world. The bird-seed grass, an annual native to the Mediterranean region, is cultivated in North America and also runs wild there. The plant grows to 2 ft. in height and is sometimes used for hay. It has dense, oval, headlike spikes about 1 to 2 in. long, and ornamental green-and-white markings. The shining, straw-colored grains, commonly called seeds, are about ¼ in. long, and are fed to cage birds. They are also used as cereals and for bread flour in parts of Europe. Another canary grass, *P. arundinacea,* is a 6-foot perennial; it is an important forage grass in wet regions. A variety with white-striped leaves (var. *picta*) is cultivated in gardens as ribbon grass.

Canary Islands, a group of islands lying about 70 m. from the N.W. coast of Africa. They make up two provinces of Spain, which are named for their respective capitals. Santa Cruz de Tenerife (area, 1,329 sq. m.) consists of Tenerife, Palma, Gomera, and Hierro; Las Palmas de Gran Canaria (area 1,565 sq. m.) comprises the islands of Gran Canaria (Grand Canary), Lanzarote, and Fuerteventura, as well as six barren, uninhabited, smaller islands. All are of volcanic origin. The climate is unusually even, and well suited for agriculture, the islands' chief source of income. The principal products are bananas, tomatoes, potatoes, dried fish, cochineal, tobacco, and embroideries. The once-famous wine industry was wiped out by the grape blight of 1853. The islands are connected with the Spanish mainland by an airline and by steamship. There is a university at La Laguna. The principal cities are Las Palmas and Santa Cruz de Tenerife; their respective populations (1949) were 106,798 and 150,010. The combined population of the Canaries was 758,328 in 1948.

The early history of the islands is obscure; they were known to the Romans and may be the Fortunate Islands mentioned by classical writers. They were claimed by Normans, Spaniards, and Portuguese, and were finally ceded to Spain in 1479 in the Treaty of Alcaçova with Portugal. Their original inhabitants, the Guanches, were largely wiped out in the early part of the Spanish occupation; the population now is chiefly Spanish.

Canasta (*kȧ-năs′tȧ*), a card game similar to rummy, that can be played by two to six people. The game is played with two packs of standard playing cards (including four jokers) shuffled together. Fifteen cards are dealt to each person when two play; thirteen cards when three play; and eleven cards when four or more play. The play of the game proceeds like rummy, with a draw pile face downward, and a discard pile face upward. The player's objective is to obtain three or more cards of a kind; it differs from rummy in that sequences are of no value. Deuces and jokers are wild cards, but each meld must include at least two natural cards and not more than three wild cards. Seven of a kind are a canasta. Scoring is according to the cards melded, with special bonuses for such plays as going out first, red threes, and natural canastas. The game of canasta (Spanish word for basket) originated in Argentina.

Canberra (*kăn′brȧ*), the capital of Australia, on the Molonglo River, located in a federal territory which formerly was a part of New South Wales. It is about 204 m. S.W. of Sydney and 510 m. N.E. of Melbourne, with which it is connected by railroads and highways. Australia's government buildings are located here, as well as the School of Forestry, University Coll., Canberra Technical Coll., and the Museum of Zoology. The National Univ. of Australia will be established here. Many fine residences border the parks and squares. The industries consist largely of local trade and inland transportation. Canberra, surveyed in 1908, was not ready for occupation before 1927, when the parliament buildings were opened. It is a federal territory, similar in status to Washington, D.C. Population, 1959, 44,780.

Canby (*kăn-bĭ*), EDWARD RICHARD SPRIGG, Union officer, born in Kentucky in 1817; shot by Indians during peace talks in northern California, April 11, 1873. He was graduated from the U.S. Military Acad. in 1839 and served at Veracruz during the Mexican War and in the Civil War. He captured Mobile in 1865, and in 1866 he was raised to the rank of brigadier general.

Canby, HENRY SEIDEL, author and literary critic, born in Wilmington, Del., Sept. 6, 1878; died in Ossining, N.Y., April 5, 1961. He studied at Yale Univ., receiving his Ph.D. in 1905. He joined the Yale faculty in 1900. Noted for numerous essays on contemporary literature, he was asked (1920) to establish the *Literary Review* (a supplement of the New York *Evening Post*), remaining its editor until 1924. In the same year, he and friends founded the *Saturday Review of Literature* (now the *Saturday Review*), of which he was editor until 1936 and chairman of the board of editors thereafter. He also served as a member of the board of judges of the Book-of-the-Month Club (1926-54), which he helped to found. His major writings were in the field of biography, including "Thoreau" (1939), "Walt Whitman, an American" (1943), and his autobiography, "American Memoir" (1947).

Cancan (*kăn'kăn*), French, literally meaning noise, scandal; it became the name for a dance somewhat resembling the quadrille, but more unrestrained, which originated among members of the Parisian demi-monde and was introduced into public halls around 1830. The most famous cancan music was written by Jacques Offenbach (1819-80), for his operetta, "Orpheus in the Underworld" (1858).

Cancellation (*kăn-sĕl-lā'shŭn*), the process of shortening indicated division by rejecting the same factors from both dividend and divisor. It depends upon the principle that if the same factor be rejected from the dividend and the divisor both terms are divided by that factor, or dividing both dividend and divisor by the same number does not affect the quotient. Cancellation was formerly treated by itself in a chapter in elementary textbooks, but it is now generally placed with the definitions of elementary processes. The following serves as an illustration of the process:

$$\frac{3 \times 7 \times 6}{3 \times 6} = 7 \qquad \frac{\cancel{3} \times 7 \times \cancel{6}}{\cancel{3} \times \cancel{6}} = 7 \qquad 7 = 7$$

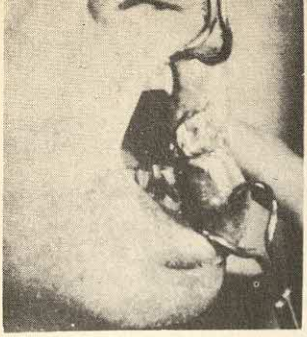
Cancer (*kăn'sẽr*), the popular name of a malignant tumor found in different parts of the body. Physicians generally divide the disease into two main categories: *carcinoma,* where the tumor starts in epithelial tissues such as the skin or the lining of the mouth, of the intestinal tract, of the lungs, etc., and *sarcoma,* where the tumor originates in connective tissue such as bones, muscles, nerves etc. Cancer is a disorderly, uncontrolled growth of cells, and is found in plants, fish, animals, as well as man.

In normal growth the original cell does not increase its size, but splits and forms two cells, two cells divide into four, and four into eight. Cell division is rapid in the embryo and after birth gradually slows until at maturity there is only enough normal cell growth to replace tissues that are injured or worn out. With growth comes specialization so that normal cells can unite to serve useful functions as parts of the body. Malignant cells invade and spread through healthy tissues and may gradually work their way into a blood vessel or lymph canal which carries the diseased cells to secondary locations where they may start growing again. In the early stages cancer may be removed by surgery or destroyed by radium X-rays; when it has spread to secondary locations the disease usually cannot be curbed. Therefore much emphasis is placed on early diagnosis.

Two commonly accepted factors appear to be involved in the change from normal to malignant growth: First there must be a readiness, of complex origin, within the cells to throw off the controls that regulate growth. Second, there must be a stimulation of the cells which may be chemical, as in the hormones secreted by the ductless glands, physical as in X-rays or the sun's ultraviolet rays, or mechanical in the form of chronic irritations, as when a loose-fitting dental plate chafes the gums or a sore lingers in the cervix of the uterus after childbirth. In men more than half the fatal cancers start in the digestive tract (stomach and intestines); also important as sites of origin are the lungs and prostate gland. In women cancers of the uterus and breast cause nearly 40 per cent and those of the digestive tract, 35 per cent, of the deaths from this disease. Cancer in both sexes occurs on the skin, the mouth, lips, throat, kidneys, bladder, etc. Half of those who die of cancer are under 65 and ninety per cent are over 40 years of age. See also *Tumor.*

Recent progress in the treatment of cancer has been in improved and radical surgery as well as in refinements of irradiation techniques. Promising experiments are being conducted in treating cancer with nitrogen mustards, various sex hormones, and radio-active iodine and phosphorus. The new hormones ACTH and cortisone show considerable promise in controlling some leukemias. As yet these are only palliatives that make the patient more comfortable.

Because early diagnosis and prompt treatment are the keys to cancer control the U.S. Congress



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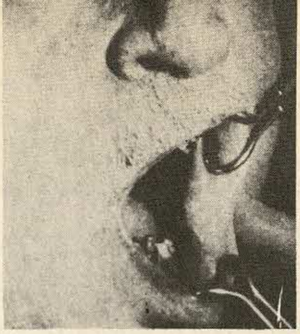

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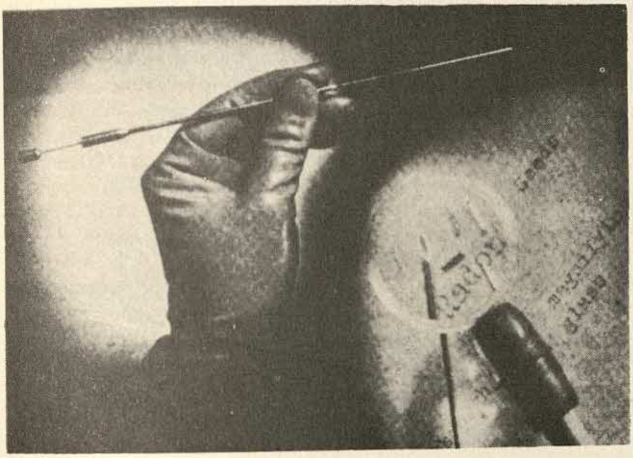

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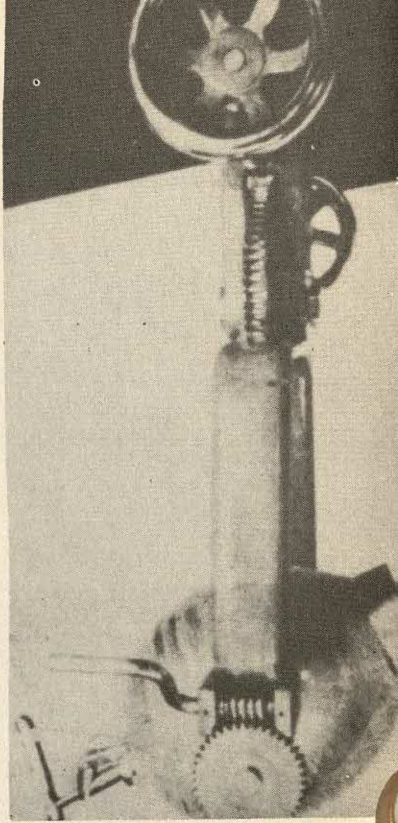

3

Courtesy Amer. Cancer Society, N. Y.

CANCER

1 and 2. Cancer of the mucosa of the cheek before and after treatment. Treatment was given by a combination of X-radiation and implantation of radon seeds

3. Less frequently used than the other two methods of applying radium to the treatment of cancer is the radium pack. This pack, or "bomb," as it is nicknamed, contains four grams of radium and is valuable in reaching deep-seated internal cancers. The malignant growth thus receives a maximum of the rays while the surrounding healthy cells are not dangerously hurt

4. Another method of using radium in treating cancer is by capturing the gas—radon—which this element gives off when it is in solution. The radon gas is sealed in tiny gold or platinum containers, called seeds, shown under magnifying glass. The seeds are placed by the holder illustrated above in the cancer itself. Radon gives off powerful radon rays at sufficient strength to be effective for at least 10 days.

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appropriates large amounts for the National Cancer Inst. This agency and the privately supported American Cancer Society conduct national research programs and cancer control activities.

Cancer, in astronomy, the fourth sign of the zodiac. The northern tropic is known as the Tropic of Cancer. See *Zodiac; Tropics.*

Candia (*ḳăn′dĭ-ȧ*). See *Crete.*

Candle (*ḳăn′d'l*), a cylinder of wax or fatty matter containing a wick used for lighting. Candles are made principally of tallow, paraffin, bleached wax, spermaceti, bayberry tallow, palm oil, and stearin. They are primarily divided into *dipped* and *molded* candles, according to the mode of their manufacture. Dipped candles are made by stretching a number of wicks on a frame, and dipping them into melted tallow from time to time until a sufficient amount has accumulated around the wicks to form candles. Molded candles are made by melting the tallow and casting it in molds, in which the wicks have been previously fixed; when cooled the candles are withdrawn.

Candleberry (*ḳăn′d'l-bĕr-ĭ*), or BAYBERRY, a small tree native to the eastern part of North America, but most abundant in the southern part of the U.S. It attains a height of about 18 ft., but is usually a low-spreading shrub and has oblong evergreen leaves. The fruit consists of small berries, which, when ripe, are covered with a greenish-white wax, known as bayberry tallow. Four or five pounds of tallow are obtained from a bushel of berries. It is used for candles, which burn slowly and emit a pleasant odor, and in some localities it serves to make a soap. A species of this tree, native to Japan, attains a height of 50 ft., and is cultivated in California for its edible fruit.

Candlefish (*ȼăn′d'l-fish*), a fish native to the Pacific Ocean, off the western coast of North

America, from Oregon to Bering Sea. It is classed with the smelt family, has a somewhat pointed and conical head, and grows to a length of 15 in. The flesh is preferred to that of the trout, and an oil is obtained from it quite similar to cod-liver oil. The oil in these fish is used by the Indians for lighting. A rude light is obtained by drawing a piece of rush pith or tree bark through the fish as a wick.

Candlemas (*kăn'd'l-màs*), the feast of the purification of the Virgin Mary, instituted in the year 492. It is observed on Feb. 2. The feast is kept by the Roman Catholic Church. In its observance lighted candles are carried in a procession, and the candles to be used the ensuing year are consecrated on that occasion.

It is the oldest of all the feasts in honor of the Virgin Mary.

Candle Nut (*căn'd'l-nŭt*), a tree native to the East Indies and Madagascar. It bears a nut with a hard shell about the size of a walnut, the kernel of which is used as food and for the manufacture of oil, known as walnut oil and kekune oil. The natives obtain lampblack from the shell, and in some localities burn the kernels as torches.

Candy (*kăn'dy̆*), a form of crystallized sugar used as an article of confectionery. It is made by boiling sugar or syrup to render it hard and transparent. The industry of candy making has assumed large proportions and is an important enterprise in many countries. French candy is highly regarded because of its taste, and has recently been introduced into the U.S. The candy market is well represented in nearly every country of the world. In most places candy is sold in connection with other articles, usually in drug and grocery stores, but in the larger cities it has come to be handled to a large extent as a distinct line.

The art of candy making is concerned in producing a large variety of confections. Many of the sweetmeats are flavored with fruits or essences, such as lemon, strawberry, peppermint, vanilla, etc. The nuts, such as peanuts and walnuts, are used in making choice candies. Among the varieties are caramels, chocolate creams, and rock candy.

In making candy the sugar is usually dissolved in water with a small amount of glucose added to give the necessary consistency, and this is boiled until the proper thickness is secured. It is next poured on slabs of marble to cool, after which it is worked to give it hardness and the desired color. It is cast in cornstarch molds to give it form and size, and a press is used to form figures or mottoes. The manufacture has grown to such an extent and has assumed such various forms that many classes and kinds of candy are produced, some of which are beautiful and quite nutritious. The harm attending the consumption of candy is due to an excess in eating it which in severe cases can lead to tooth decay as well as obesity.

Canella (*kȧ-nĕl'lȧ*), a small tree native to the warmer part of North America, often called wild cinnamon in Florida and the West Indies. It bears a small black berry, and its bark is known in commerce as white-wood bark. All parts of the tree are highly fragrant and the bark has an acrid, pungent taste. It is employed as a stimulant tonic.

Canis Major (*kā'nĭs mā'jẽr*), a constellation of the Northern Hemisphere, located under the feet of Orion. Its principal star, Sirius, is the brightest of all the stars. Near the constellation of Canis Major, just below Gemini, is Canis Minor, which contains Procyon, a star of the first magnitude.

Cankerworm (*kăn'kẽr-wûrm*), the larvae of two species of moths, sometimes called measuring worms from their peculiar locomotion. They are abundant in Canada and the northeastern part of the U.S., where they attack fruit trees, especially apples and pears. The eggs are deposited by the wingless female in orchard trees, and the larvae are destructive to the foliage in the early period of their life, but later they descend to the ground, where the metamorphosis takes place. Many fruit trees and currant bushes are stripped of leaves in the spring by these insects, which are very voracious.

Can Making (*căn māk'ing̃*), the art of making vessels for holding and carrying liquids, usually of tinned iron or other sheet metal. This enterprise has grown remarkably since the industry of canning vegetables, fruits, meats, milk, spices, varnishes, and paints has been developed. In the U.S. there are 10 or 12 large establishments engaged in can making for supplying canning factories. The larger establishments have a daily output of over 100,000 cans. Oysters, fruits, and vegetables are packed in round cans of various sizes, mostly from one to three pounds each, but some are as large as a half gallon or a gallon. Fish, sardines, and meats are packed in oval cans. Can making is carried on entirely by automatic machinery, which is used both in cutting and soldering the cans.

Cannae (*kăn'ē*), an ancient town in Italy, on the Aufidus River, now called Ofanto, which became famous on account of a great victory won by Hannibal over the Romans, Aug. 2, 216 B.C. He commanded the Carthaginian army of 10,000 cavalry and 40,000 infantry. The Roman army under Aemilius Paulus and Terentius Varro consisted of 6,000 cavalry and 80,000 infantry. By skillful maneuvering Hannibal was able to force the Romans into a position in which they were required to face the sun and a strong wind, while he occupied points of advantage and led the attack with fearful slaughter to the Romans. Fully 70,000 Romans were killed and the Carthaginians lost only 6,000.

Cannel Coal (*kăn'nẹl kōl*), a variety of bituminous coal which is very dense and compact. It is of a dull bluish or grayish black color and has little luster. It is used mostly in the manufacture of gas and oils. On distillation it yields from 40 to 65 per cent of volatile matter. The cannel coal fields of the eastern part of Kentucky are the most extensive in America, but it is found in smaller deposits in Ohio, Indiana, and Scotland.

Cannes (*kàn*), a city of France, in the department of Alpes-Maritimes, 22 m. s.w. of Nice. It is located on the Mediterranean, has railroad facilities, and is the seat of considerable export and import trade. The vicinity produces large quantities of olives, figs, oranges, and other fruits. The chief building is the Abbey of Donjon, built about 1070. Among the newer structures are a library, a town hall, and a museum of antiquities. Cannes is the place where Napoleon landed in 1815, when he returned from Elba. Population, over 30,000.

Cannibal (*kăn'ĭ-bạl*), one who eats human flesh. The practice of eating human flesh has existed from very ancient times, but the name now applied to it was originated about the time when Columbus discovered the West Indies, where the Caribales were a man-eating race. The practice was known in the time of Homer, and he ascribes it as an unnatural attribute to Polyphemus. Cannibalism was practiced in North America by the Atakapa Indians and other tribes on the coast of the Gulf of Mexico. The Aztecs made human sacrifices to their gods and afterward the bodies were eaten by the populace. Cannibalism still prevails among certain tribes of Australasia and Central Africa.

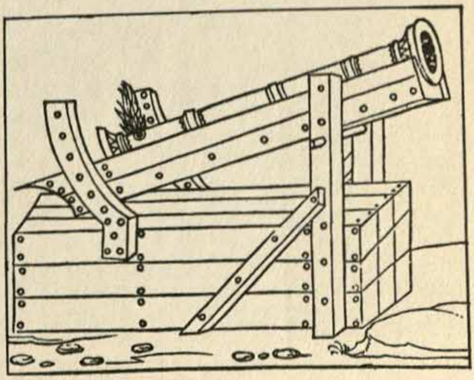
Canning (*kăn'nĭng*), the industry of preserving fish, meats, fruits, and other articles of food in air-tight cans. Nicholas Appert, a Frenchman, discovered this process in 1795, and it was introduced in Canada and the U.S. in 1815. In canning it is necessary to destroy the germ which causes fermentation, which is done by cooking the product to be canned, either before or after it is placed in the can. The cans used in the industry are manufactured in large establishments and sold to canning factories. In canning vegetables or cereals they are placed in cans by machinery, after which the cans are carried to soldering machines and soldered by automatic devices. The labels are put on the cans by a machine, which spreads the paste and adjusts the label to its proper place. The most important products canned are fish, beef, corn, tomatoes, peas, beans, and fruits.

In the U.S. there are over 2,250 canning factories, the largest number being operated in Maryland, but there are more or less in all the states. The following states lead in the industry: Maryland, Maine, New York, Virginia, New Jersey, Delaware, and California. There are no less than 28,000 fishermen employed in gathering mackerel, white fish, salmon, and other fish for canning purposes, using 3,000 fishing vessels, while about 21,500 men are employed in dredging for oysters. The lands used in producing vegetables and cereals for canning purposes aggregate 1,500,000 acres. It is shown by the census that 3,000,000 persons are indirectly connected with the business, while 1,000,000 secure employment during the canning season. The canned meat produced annually is valued at $35,000,000, while the fish, fruits, and cereals aggregate much more.

Canning, GEORGE, statesman and orator, born in London, England, Apr. 11, 1770; died Aug. 8, 1827. He was educated at Eton and Oxford, and distinguished himself early as a writer and speaker. In 1794 he entered Parliament, making a marked impression early in his official career. Later he was treasurer of the navy, was twice secretary of foreign affairs, and was made prime minister in 1827, serving until his death the same year. He is known chiefly for the foreign policy he promulgated, which was noninterventionist and favorable to liberal and national movements. His influence has been counted important in the dissolution of the Holy Alliance (*q.v.*) and in the rise of Greece and of the South American republics.

Canning, SIR STRATFORD. See *Stratford de Redcliffe, Viscount.*

Cannon (*kăn'nŭn*), a gun or piece of ordnance fired from a fixed or movable mount, throwing its projectile by the use of an explosive. No definite facts are available concerning the invention or first use of the cannon, some attributing it to the Chinese, some to the Arabs, but the majority to a German monk, Berthold Schwartz (1313), generally acknowledged to be the discoverer of the propulsive power of gunpowder. The first cannons were constructed of wood, bound about with iron bars and lined with copper or sheet iron. At first, cannons were small, weighing only about 30 to 40 pounds, but by the close of the 14th century, stone shot fired from cannon



15TH CENTURY CANNON

Official U. S. Navy Photo

RIFLING A GUN BARREL

Cast solid, gun barrels are later bored, oil being poured through the barrel to reduce friction and carry away waste

had reached a weight of from 400 to 450 pounds.

Edward III of England successfully employed cannon at Calais in 1346 and they were utilized successfully by the Turks at Constantinople in 1394, after which they came into general use. In the early part of the 16th century, very heavy bronze and iron guns were made in western Europe, but by the following century they had become lighter. After 1739, they were cast solid and afterwards bored, a process which made for uniformity of caliber.

Cannon may be classified in three types: 1) guns; 2) howitzers; 3) mortars. Guns have a long barrel in relation to the caliber, a flat trajectory, and a high muzzle velocity. Howitzers have a medium barrel length in relation to the caliber, a curved trajectory, and medium muzzle velocity. Mortars have a short barrel in relation to the caliber, an extremely curved trajectory, and a medium to low muzzle velocity. The small mortars used by the infantry are smooth bore and muzzle loading. A large mortar was developed by the U.S. for the invasion of Japan in World War II, but the war ended before it could be used.

Cannon at first were not provided with sights, a precaution probably not necessary, since the range was not much more than a hundred yards. The first sight used on a cannon was probably the dispart sight, which came into use about 1600. The 19th century saw the introduction of a fixed rear sight and the tangent sight introduced by the British Navy. About the mid-19th century the telescopic sight now in common use was invented. The extreme range of cannon today depends on the size of the weapon, the powder charge, and the angle of elevation. In World War I, the

Official U. S. Navy Photo

MANUFACTURE OF 40 MM. ANTI-AIRCRAFT GUNS

Official U. S. Army Photo

81 MM. MORTAR

This weapon fires three types of shells: high explosive, demolition, and smoke. Effectiveness of this mortar compares well with that of a 105 mm. howitzer

German "Big Bertha" shelled Paris at a distance of 72 m. The use of the airplane in World War II eliminated the need for cannons of such extreme range. All of the cannon of modern manufacture, with the exception of small mortars, are rifled.

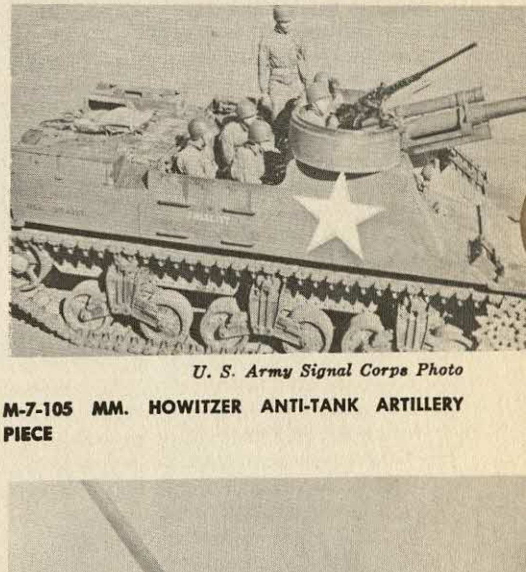
See also *Caliber; Gun.*

Cannon, GEORGE Q., an apostle of the Mormon Church, born in Liverpool, England, Jan. 11, 1827; died Apr. 12, 1901. At an early age he embraced the teachings of the Mormon Church. He came with his parents to Nauvoo, Ill., about 1844, and was one of the founders of Salt Lake City. In 1850 he went as a missionary to the Sandwich Islands, where he translated the "Book of Mormon" into the Hawaiian language, and on returning to Utah, in 1854, he edited the *Deseret News.* He represented Utah in Congress, 1872-81, as a territorial delegate, and in the latter year was deprived of his seat because he was a polygamist. He was a member of the legislative council of Utah six years, and published a number of tracts favorable to the Mormon Church.

Cannon, JOSEPH G., statesman, born in Guilford, N.C., May 7, 1836; died Nov. 12, 1926. After studying in his native town, he took up the study of law, and served as state's attorney in Vermilion County, Illinois, 1861-68. He was elected to Congress as a Republican in 1872, where he served successively until 1891, and was again elected in 1892 and at several succeeding elections, the last time in 1920. He was influential on the floor of the House, held a number of important positions on committees, and was speaker several terms. As presiding officer he was criticized adversely for his conservative views on tariff revision.

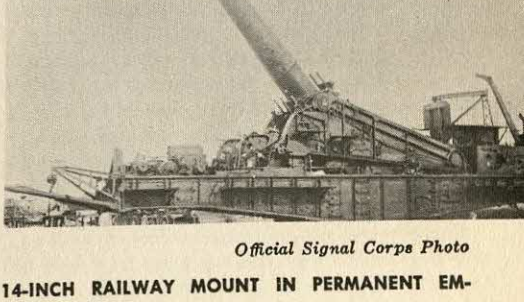
Cano (*kä'nô*), ALONZO, painter and architect, born in Granada, Spain, Mar. 19, 1601; died Oct. 3, 1667. He studied painting under Juan de Castillo and sculpture under Martinez Montanes, and originated a class of painting known as the School of Granada. Philip IV appointed him court painter in 1638, and he remained in his native town for some time as painter in the churches. His work in architecture is represented by a number of buildings in Madrid and Granada. His chief works in painting include "Conception of the Virgin" and a large number of portraits.

Canoe (*kȧ-nōō'*), a small, narrow boat propelled by paddling. Canoes were used extensively by uncivilized people. Many were constructed by laying thin strips of wood across each other at



U. S. Army Signal Corps Photo

M-7-105 MM. HOWITZER ANTI-TANK ARTILLERY PIECE



Official Signal Corps Photo

14-INCH RAILWAY MOUNT IN PERMANENT EMPLACEMENT

Courtesy Wisc. Conservation Dep't.

CANOEING

various angles, which were tied together, and then covered with pieces of bark or hide. They were generally propelled by paddles, but some of the larger ones carried sails. The American Indians made canoes of cedar wood covered with an unbroken sheet of the bark of the white birch, while the Indians of the plains used buffalo hides. Strong and durable canoes were made in forest districts by hollowing out birch logs, and this kind was probably the best made by primitive people. The Fiji Islanders now construct boats of very large size, some 100 ft. in length. The Society Islands contained a naval force, at the time they were visited by Captain Cook, consisting of 1,700 war canoes, manned by 68,000 soldiers. The Eskimos make canoes of walrus and seal skins stretched over whalebone, while those constructed by the natives of the Polynesian Islands are made of planks. Stanley (*q.v.*), in his African travels, found canoes used by the natives on inland lakes that consisted of very light material, often of seaweeds, and larger ones of skin and bark capable of carrying 8 or 10 men.

The name *canoe* is now applied to any small boat, pointed at bow and stern, and used for long voyages or for sports and pleasure. The canoe most commonly used is 16 to 20 ft. long. John Macgregor traveled 3,000 m. in his Rob Roy canoe. Some are made for only one person, while others are for two or more, and like the Eskimo *ḳayaḳ*, or fishing boat, are fully decked, with the covering laced around the paddler, who sits in the center. The American Canoe Association has several thousand members, and its official magazine, *The American Canoeist*, is devoted to the interests of sports and pleasure with the canoe. Other American organizations are the Northern Association of Canada and the New York Canoe Club. Indeed, many canoe clubs are maintained wherever lakes and rivers are accessible.

Cañon (*ḳăn'yŭn*). See *Canyon*.

Canon (*ḳăn'ŭn*), a rule or ordinance made by an ecclesiastical council in relation to religious matters. A canon rule instituted by Gregory the Great provided for the celebration of the mass with more splendid accompaniments than had hitherto been used, while others of the Catholic Church constitute laws and regulations for observance by the lay members. Other canons of historical interest include those passed for the government of the Church of England and the anciently adopted Old Testament and New Testament canons. The Old Testament Canon, anciently adopted on the authority of the Jewish Talmud tradition, was designed to give public sanction to the Pentateuch. The New Testament Canon came into force about 170 A.D., by which the books of the New Testament were declared to be canonical.

Cañon City, county seat of Fremont County, Colorado, on the Arkansas River, 40 m. w. of Pueblo. It is on the Denver & Rio Grande, the Atchison, Topeka & Santa Fé, and other railroads. The site of the city is 5,340 ft. above the sea, surrounded on three sides by mountains, and is noted as a pleasure and health resort. The Royal Gorge and the Skyline Drive are near the city. Cold and thermal mineral springs abound in the vicinity. The chief buildings include the public library, the high school, and the state penitentiary. Coal, iron, silver, copper, petroleum, and building stone are obtained in the vicinity. Population, 1930, 5,938; in 1940, 6,690; in 1950, 6,345.

Canonization (*ḳăn'ŭn-ĭ-zā'shŭn*), in the Roman Catholic Church, an act of the Pope by which a deceased person becomes a saint. This act represents the final stage of a lengthy process during which the merits and demerits of the person are pondered, a process which sometimes lasts for more than 100 years (see *Advocatus diaboli*). The germ of this procedure is to be found in the veneration of martyrs in the early Christian church. The first canonizations took place in the 10th century, the whole system being strictly formulated by Pope Urban VIII, in 1625 and 1634. A later development provides that before being canonized the deceased must be beatified by a special degree of beatification which bestows the title of "blessed," *i.e.,* Bernadette (*q.v.*) of Lourdes, and Mother Cabrini (*q.v.*) now canonized. Proof of at least two miracles performed is a primary condition of the procedure. See *Beatification; Miracle.*

Canopy (*ḳăn'ō-pȳ*), in architecture, an ornamental arched or rooflike projection, with a niche or doorway. The term is applied in Gothic architecture to the rich covering over tombs, doors, and windows. In Germany and France the canopies of early times were elaborate and complicated, while those of England are usually simple in form. The cathedrals of Europe as well as many of the larger churches furnish examples of canopies.

Canossa (*ḳä-nŏs'sä*), castle in Northern Italy, which has become proverbial in the phrase "to go to Canossa." This figure of speech signifies humiliation so great that one must go to one's enemy to ask for his pardon. The Emperor Henry IV (1060-1106) of the Roman German Empire, who had waged war against Pope Gregory VII, was finally compelled (1077) to ask for the lifting of the excommunication decree against him. Seeking out the Pope at Canossa, he waited three days, bareheaded and barefoot, before the Pope finally agreed to abrogate the excommunication order.

Canova (*kä-nô′vä*), ANTONIO, sculptor, born at Possagno, Italy, Nov. 1, 1757; died in Venice, Oct. 13, 1822. He worked first in the then conventional rococo style (*q.v.*). Gaining familiarity with the works of antiquity in Rome and Naples, he changed his approach and soon became the leader of neoclassicism in Italy. He opened a studio at Rome in 1781 and gained international fame for his sculptures of mythological themes (*e.g.*, "Three Graces" and "Cupid and Psyche") and for his tombs and sculptured portraits (*e.g.*, monuments to Pope Clement XIII, Pope Clement XIV, Napoleon, Paolina Borghese [Pauline Bonaparte], and George Washington).

Canovas del Castillo (*kä′nô-väs dĕl käs-tēl′yō*), ANTONIO, statesman, born in Málaga, Spain, June 5, 1828; assassinated at Santa Agueda, in August 1897. He studied philosophy and law at the Univ. of Madrid, but later entered politics. In 1852 he was elected to the Cortes as a Liberal, and in 1874 supported the restoration of Alfonso XII to the throne. He was prime minister, 1874-79, being succeeded by Martínez Campos, but held the premiership several terms after 1880. He was made a member of the Academy of Madrid in 1867 and wrote several important books, including "History of the Decline of Spain from the Accession of Philip III to the Death of Charles II."

Canso (*kăn′sō*), a seaport of Nova Scotia in Guysborough County, near Cape Canso. It has considerable trade in merchandise and is the seat of several consular agents. The waters of its coast have valuable fisheries. Canso is the landing place of several trans-Atlantic cables. Population, *ca.* 1,500.

Canso, STRAIT (or GUT) OF, a narrow channel separating Nova Scotia from Cape Breton Island. It is about 1 m. wide and about 15 m. long, and connects Chedabucto Bay with the Gulf of St. Lawrence. Cape Canso, the eastern extremity of Nova Scotia, is the east side of Chedabucto Bay, projecting into the Atlantic Ocean.

Courtesy Brown Bros., N. Y.

PAOLINA BORGHESE. SCULPTURE BY CANOVA

Cantabrian Mountains (*kăn-tā′brĭ-ạn*), a range of highlands in the northern part of Spain, near the shore of the Bay of Biscay. They extend a distance of 300 m., from the Pyrenees to Cape Finisterre, and their loftiest summits are near the central part. Many promontories characterize the coast, while the slopes toward the east and south are gradual and have fertile valleys. The altitudes range from 2,675 ft. to 8,787 ft., the latter figure being the height of Torre (or Peña) de Cerredo.

Cantaloupe (*kăn′tȧ-lōp*). See *Muskmelon*.

Cantata (*kȧn-tä′tȧ*), a poem or dramatic composition set to music, in which solos and choruses are rendered. It originally assumed the form of an opera, with voice parts and accompaniments by the violin and other instruments, but is now shorter than either opera or oratorio. The cantata includes compositions of either sacred or secular choral works, and may be lyric or dramatic. It differs from opera in having no stage accessories.

Canteen (*kăn-tēn′*), a vessel of metal or leather, in the form of a flask or bottle, used to carry water or other potable liquids. Also a service bar where one may obtain food and drink. U.S.O. and Red Cross canteens gained fame during World War II.

Canterbury (*kăn′tĕr-bĕr-ĭ*), a city in S.E. England, in the county of Kent, 62 m. S.E. of London. The surrounding area is mainly an agricultural district, noted for corn, hops, and cattle.

Canterbury, then called Durwhern, was already a town when the Romans invaded England; the Romans named it Durovernum. The name Canterbury is of later origin (Saxon, *Cantwaraburh*). For more than 1,000 years Canterbury has been the ecclesiastical metropolis of England. It became the seat of an archbishop in A.D. 597, when St. Augustine was appointed to that position. About 100 years later, Archbishop Theodor (668-693) succeeded in obtaining general recognition from all the English bishops that the Archbishop of Canterbury should be the guider of English ecclesiastical policy. From the time of St. Augustine until the murder of Thomas à Becket (*q.v.*) in 1170, English political and social developments (principally as related to the Church) shaped the history of the town. When England separated herself from the Roman Catholic Church, the Archbishop of Canterbury retained his superior position over the Anglican

Courtesy British Information Services, N. Y.

CANTERBURY CATHEDRAL

clergy and so became the symbol of the Anglican Church.

The major feature of the city is Canterbury Cathedral, built from 1070 to 1495, one of the principal monuments of Norman and English Gothic architecture. Lanfranc (1070-89), the first Norman archbishop, began to erect the new cathedral in the Norman style; this structure was finished in the middle of the 12th century. After this building had been partly destroyed by fire, the architect William of Sens, who introduced Continental architectural forms into England, began the erection of the present structure, which was finished more than 250 years later, in the Perpendicular style (*q.v.*). The central tower (235 ft. high) was a work of the late 15th century. Besides being famous for its monumental appearance and rich sculptural decoration, Canterbury Cathedral was also widely known for its wonderful stained-glass windows (many of these destroyed during World War II), and the tomb of Edward, the Black Prince, bearing an expressive sculptured portrait. During World War II, much of the cathedral, as well as many other buildings in the city, suffered severe bomb damage. Population (1947 est.), 24,850.

Canterbury Tales, a collection of tales supposedly told by a group of pilgrims going to the shrine of Thomas à Becket at Canterbury, written by Geoffrey Chaucer (*q.v.*). Besides the insight they give into the life of the times, they are a major landmark in the development of the English language. Some 17,000 lines in length, they are written mainly in heroic couplets.

Canticles (*kăn'tĭ-k'lz*), in Christian theology, another name of the Song of Solomon (*q.v.*), or the Song of Songs, and called in Latin, *Canticum canticorum*. This part of the Old Testament was canonized relatively late (A.D. 90), through the influence of Rabbi Akiba. It was later interpreted as having a mystical allegorical meaning beyond its actual literary content. Since about the 19th century, the term canticle has more generally come to mean hymns or chants such as those in the Book of Common Prayer.

Cantigny (*kän-tē-nyē'*), a small village near Amiens, France, the site of the first U.S. offensive in World War I, May 28, 1918, under Gen. Robert Lee Bullard. Population, about 130.

Cantilever (*kăn'tĭ-lĕv-ẽr*), a bracket of wood, iron, or stone used in architecture for supporting balconies and cornices. The cantilever has been utilized in the construction of bridges, in which two brackets are built out, one from each side of the ravine to be spanned, to meet at the center without the support of intermediate piers. The first great bridge built in America in which the cantilever principle was used was the one spanning the Niagara River and in use from 1883 to 1925; it had a length of 909 ft. and a central span of 119 ft. Another bridge of this class crosses the St. John River, in New Brunswick. It is 813 ft. long and the main span has a length of 477 ft. The Poughkeepsie Bridge, across the Hudson River, has five spans and is 6,767 ft. long. The Quebec Bridge has a span of 1,800 ft., the longest single span in the world. See *Bridge*.

Canton (*kăn-tŏn'*), an important commercial city and port in Southern China. It is located in the province of Kwangtung, on the Si-kiang River, about 32 m. from the China Sea. The city is of great antiquity and is mentioned in history as early as 250 B.C. It became an important market and seaport in A.D. 700, and was long famous as a trading point for Arab voyagers. In the 16th century it was visited by the Portuguese and 100 years later by the Dutch. England monopolized its commerce from the 17th century up to 1834, when trade with other European nations became important. In 1857 it was captured by the allied forces of French and English and was garrisoned by them until 1861, since which time it has been open to the commerce of all nations.

The city is surrounded by walls 20 ft. thick and from 20 to 40 ft. high, with a partition wall dividing it into the old and new parts. In the old portion of the city are many Buddhist temples. The largest of these is located on Honan Island, covers seven acres, and is called the "Temple of the Ocean Banner." Another famous temple is situated in the western suburbs, called the "Temple of Five Hundred Gods," in which 500 statues commemorate Buddha and his disciples. About 200,000 people make their homes in the *ca.*

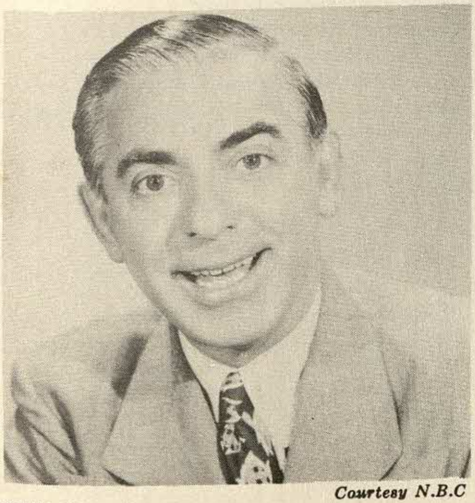
40,000 boats anchored in the river opposite the city.

Canton has large industries for the manufacture of porcelain, paper, glass, silk, cotton goods, sugar, ivory carvings, lacquered ware, and utensils. It was the chief city for foreign commerce of China until 1850, when it was surpassed by Shanghai, but its normal annual imports and exports aggregate about $40,000,000. Foreign mercantile houses and the consulates occupy the southwestern part of the city. The religion of the Chinese in Canton is largely Buddhism. Education is provided for in elementary schools, and there are a number of institutions which offer training in higher learning and the arts, especially sculpture and painting in the Chinese style. The Japanese controlled Canton from 1938 to 1945. It became the Nationalist provisional capital early in 1949 but was abandoned to the Chinese Communists in October of that year. Population, *ca.* 1,000,000.

Canton (*kăn'tŭn*), a city in Fulton County, Ill., about 25 m. s.w. of Peoria, on the Toledo, Peoria & Western and Chicago, Burlington & Quincy R.R.'s. It has a thriving trade in grain, coal, and merchandise. The manufactures include plows, brooms, machinery, marble products, tile, and flour. It was settled in 1832 and incorporated in 1849. Population, 1920, 10,928; in 1930, 11,718; in 1940, 11,577; in 1960, 13,588.

Canton, a city in east central Ohio, seat of Stark County, 20 m. N.W. of Akron. It is served by the Pennsylvania, the Baltimore & Ohio, and the New York, Chicago and St. Louis R.R.'s. The Akron-Canton Airport is 10 m. N.W. of the center of town. Canton is the site of a national memorial to President William McKinley, whose home was in Canton. The city's system of parks covers *ca.* 600 acres, including a 40-acre arboretum.

Primarily an industrial community, Canton has manufactures of steel, brick and ceramic tile, roller bearings, vacuum cleaners, industrial presses, and forgings. The surrounding area produces truck crops, poultry, and dairy products. Its mineral deposits include coal, clay, and limestone. The city is the center of the Canton Standard Metropolitan Statistical Area (1960 pop., 340,345), which includes all of Stark County. In 1958 the city had a value added by manufacture of $245,866,000. Canton was settled in 1806 and incorporated as a city in 1854. Population, 1900, 30,667; in 1940, 108,401; in 1950, 116,912; in 1960, 113,631.



Courtesy N.B.C

EDDIE CANTOR

Cantor (*kăn'tôr*), EDDIE, actor and comedian, born in New York City, Jan. 31, 1892. Born Edward Israel Iskowitz, he was orphaned by the age of two. He began his career in vaudeville at 16 and soon developed the blackface routine that became his trademark. His first hit was in "Canary Cottage" (1916). Subsequent successes included three editions of the Ziegfeld "Follies" (1917-19), "Kid Boots" (1923), "Whoopee" (1928), and "Banjo Eyes" (1941). He starred in many motion pictures, in his own radio program, and, after 1950, on television. In 1953 a film biography, "The Eddie Cantor Story," was produced, with Cantor's voice dubbed in for the songs he had made famous. Cantor became noted for his philanthropic activities, having raised millions of dollars for various causes. He is credited with having originated the name "March of Dimes" for the annual fund-raising campaign of the National Foundation for Infantile Paralysis, founded in 1938 by President Franklin D. Roosevelt.

Canute (*kà-nūt'*) or KNUT, King of Denmark and England, born *ca.* 995; died at Shaftesbury, England, in 1035. He succeeded his father, Sweyn, or Swein, ruler of the Danes and English, in 1014. Although the Danes in England were loyal to him, he was forced to flee to Denmark when the English national council ("Witan") called upon Ethelred, earlier defeated by Sweyn, to return as king. Canute invaded England in 1015, winning much territory from Edmund Fronside, who had succeeded his father Ethelred. At first Canute governed England jointly with Edmund, but when the latter was assassinated, in 1017, he became ruler of the entire country. The first portion of his reign was unpopular because of his severity in enforcing the laws, but he soon exhibited evidences of mildness and justice. The general assembly restored English customs, and later equal rights and protection were guaranteed to both the English and Danish subjects, while many of the former received important public offices. Under his direction the government was the best experienced since the time of Alfred, and the people became friendly to him for his liberality, love of learning, and interest in song and ballad. He annexed Norway in 1028. At his death his eldest son, Sweyn, ascended the throne of Norway; the second son, Harold, that of England; and the third son, Hardecanute, that of Denmark.

Canvas (*kăn'vȧs*), a kind of coarse cloth made of flax, hemp, cotton, or other filaments. A major use in earlier days was for sails. It is used for tents, awnings, tennis shoes, many types of bags, etc., and is dyed, bleached, or used in its natural color. A finer variety called *duck* is employed in making summer clothing. Waterproofed by an application of tar or paint it is called tarpaulin and is used to cover machinery and boats. The canvas used by artists in painting is stretched on wooden frames the size of the picture desired. Its surface is made smooth by chalk and size or white lead. Still another type of canvas is known as embroidery canvas and is used for needlework.

Canvasback (*kăn'vȧs-băk*), a species of duck, 20 to 24 in. long, native to North America. It is a skillful swimmer and diver. The male has reddish plumage on the head, the bill is nearly black, and the back and sides are grayish with sparse wavy lines, similar in appearance to the surface of coarse canvas. The female has more grayish plumage than the male and is somewhat smaller. They frequent the inland waters and estuaries of rivers, where they feed on roots, insects, fishes, and mollusks, and visit fields in the spring and fall in search for grain. These birds are migratory, moving northward to breed the latter part of March, and are highly prized for their flesh.

Canyon (*kăn'yŭn*), or CAÑON, from the Spanish word for tube, and used to designate deep ravines or gorges worn by water. Canyons form on high plateaus situated in areas where abundant rainfall furnishes enough water to cut through considerable thicknesses of rock. The plateau must be composed of rock strong enough to give the canyon its vertical walls; weak rock would break down into a valley of gently rolling hills. The canyons of the Rocky Mts. and the Grand Canyon of the Colorado in Arizona are notable examples. The latter consists of gorges often 200 m. long, from 5 to 12 m. wide, and from 5,000 to 7,000 ft. deep. Many of the towering walls are sedimentary rock of purple and vermilion. Other canyons are narrow channels cut several thousand feet deep, with terraced sides or perpendicular walls. These phenomena are widely distributed throughout the Cordilleras of America from Alaska to Panama. The most noted in the eastern U.S. is the one in central New York, known as Watkins Glen, near the headwaters of Seneca Lake.

Oceanographic research has revealed the existence of great submarine canyons. Generally, these stretch seaward from the mouths of rivers and attain great length. The Mississippi canyon, for example, is 130 m. long, the Congo canyon is 80 m. long, and the Indus canyon 70 m. long.

Caoutchouc (*ko͞o'cho͝ok*), an elastic, gummy substance, obtained from the juices of several species of trees found in South America. The word caoutchouc was formerly used as a synonym for rubber (*q.v.*). Caoutchouc was first exported to Europe in the 18th century, and became useful in erasing pencil marks; bread crumbs were previously used for that purpose. It has been employed in the manufacture of lead pencils, erasers, nonconductors of electricity, and for many other purposes, such as in the making of waterproof fabrics (a patent for a process of this kind was granted to Samuel Piat in 1791). In 1823 the Scottish chemist Charles Mackintosh was granted a patent on waterproof material known by his name; and Charles Goodyear invented the vulcanizing process by which caoutchouc is rendered as hard as horn. Soft vulcanized rubber is made by adding 25 per cent of sulfur and heating the compound to about 270°F. In making hard rubber or ebonite, 50 per cent of sulfur is added and the mixture is heated to 300°F.

Cap Haitien (*kăp hä'shĕn*) or CAPE HAYTIEN, a city of Haiti, on the northern coast. Its safe and spacious harbor facilitates Haiti's important export trade in coffee, sugar, sisal, cacao, and logwood. An earthquake damaged much of the old city and killed several thousand people in 1842. Population, *ca.* 20,000.

Capacitance (*kȧ-păs'ĭ-tạns*), often called CAPACITY. The electrical size of a capacitor (*q.v.*), determining the amount of electrical energy that can be stored in it by a given voltage and the amount of alternating current that will flow at a given frequency. Capacitance exists whenever two conductors are separated by an insulating material. The basic unit of capacitance is the *farad,* named for Michael Faraday (*q.v.*); it is the value that will pass a current of one ampere when the voltage across the capacitor is changing at the rate of one volt per second. The potential of a farad is so large that the *microfarad* (one-millionth of a farad) and the *micromicrofarad* (one-millionth of a microfarad) are commonly used. The earth, for example, has a capacitance of about 700 microfarads.

Capacitor (*kȧ-păs'ĭ-tẽr*), an electrical or radio device consisting essentially of two conducting surfaces separated by an insulating material or dielectric, such as air, paper, mica, glass, or oil. A capacitor stores electrical energy, blocks the flow of direct current, and permits the flow of alternating current to a degree dependent on the capacitance (*q.v.*) and the frequency. The electrical size, or capacitance, of a capacitor is generally specified either in *microfarads* or *micromicrofarads*. A capacitor is often incorrectly called a condenser. See also *Leyden Jar*.

Capacity (*ķȧ-păs′ĭ-ty̆*), (1) in law, qualification or fitness of a person for an office or the acquisition of certain kinds of property. The artificial rules established by law for the test of one's capacity are particularly applied to aliens, infants, minors, the mentally ill, etc.; (2) in general, the ability to receive or contain, and thus, also cubic content, carrying power, or space.

Cape Ann (*ķāp ăn*), a peninsula in the northeastern part of Massachusetts, 30 m. N.E. of Boston. It is the eastern point of Essex County. The name is generally applied to the whole rocky peninsula, which extends about 10 m. into the Atlantic Ocean. This peninsula contains the towns of Rockport and Gloucester, which are connected by railroad with Salem and other cities of the state. Valuable stone quarries are worked, and extensive fisheries lie off the coast; Gloucester is one of the great fishing ports in the East. Cape Ann is a noted summer resort and an art colony.

Cape Arago (*ä-rä′gô*) or GREGORY, a cape of Oregon, at the south side of Coos Bay, on the west shore of Coos County. Near this cape is a lighthouse 84 ft. above the sea.

Cape Barrow (*băr′rô*), a headland of the Canadian mainland in Mackenzie district. It projects into Coronation Gulf, between the mainland and Victoria Island, and is located at about 68° N. lat. and 110° W. long.

Cape Breton Island (*brĭt′ŭn*), an island off the northeastern end of the Canadian province of Nova Scotia, of which it is a part. It is connected with the mainland by the Canso Causeway (1 m. long), over the Strait of Canso, and by rail lines. The island has an area of 3,975 sq. m. The central part of the island contains the navigable Bras d'Or inland salt lake, *ca.* 50 m. long and 20 m. wide, linked by canal with the southern coast and, thus, the Atlantic Ocean. The surface of the cape is rugged, and in the rocky northeast is the scenic Cape Breton Highlands National Park (390 sq. m.). Some agriculture is carried on. Minerals (coal, iron, copper) are found in commercial quantities, and fishing is a major occupation. Cape Breton Island belonged to France from 1632 to 1763, when it was ceded to Great Britain (see also *Louisburg*). It remained part of Nova Scotia except for 1784-1819, during which time it was an independent colony, with its capital at Sydney. Sydney is now capital of Cape Breton County, a world port, and a steel center; other major cities are Glace Bay, New Waterford, and Sydney Mines. The island is divided into four counties: Cape Breton, Victoria, Inverness, and Richmond. Population, 1956, 162,859.

Cape Canaveral (*ķa̤-nă′vẽr-′l*), a small, wedged-shaped area, of *ca.* 15,000 acres, located on a peninsula off Florida's central eastern coast. It is connected by road with Patrick Air Force Base (*q.v.*), *ca.* 20 m. to the south. The facilities of the Cape Canaveral Auxiliary Air Force Base are used by the Army, Navy, and Air Force to test long-range missiles and earth satellites. It is the actual launching site of the Air Force Missile Test Center, operated from Patrick Air Force Base. The first missile was launched from Cape Canaveral on July 24, 1950, and the first U.S. earth satellite (*q.v.*) was launched here on Jan. 31, 1958. See also *Missile*.

Cape Catoche (*ķä-tō′châ*), the northeastern point of Yucatan, Mexico. It was discovered by the Spaniards in 1517.

Cape Charles (*chärlz*), a cape of Virginia, forming the southern point of Northampton County, 25 m. N.E. of Norfolk. It is at the northeast side of the entrance of Chesapeake Bay, and across the bay, almost directly south, is Cape Henry. The town of Cape Charles is 10 m. N.W. of the cape, on the southwestern side of the peninsula.

Cape Clear (*ķlēr*), the southernmost extremity of Ireland, except for Fastnet rock 4 m. further south, located about 7 m. S.W. of Baltimore. It is at the southern extremity of Clear Island, which is about 1 m. wide and 3 m. long. The cape is a rocky promontory and rises 400 ft. above the sea, and on nearby Fastnet Rock is a lighthouse 148 ft. high.

Cape Cod (*ķŏd*), a peninsula extending from the southeastern part of Massachusetts into the Atlantic Ocean, forming Cape Cod Bay between its northern arm and the mainland. It was named from the great abundance of codfish caught off the shores of the peninsula. It was first discovered May 15, 1602, by Bartholomew Gosnold and was the landing point of the *Mayflower* (*q.v.*) on Nov. 9, 1620. Famous as a summer resort, Cape Cod is a cranberry- and strawberry-producing region as well as a fishing center. The peninsula comprises the whole of Barnstable County, of which Barnstable is the county seat. A canal extends across the narrow isthmus between Cape Cod Bay and Buzzard's Bay.

Cape Colonna (*ķô-lôn′nä*), a rocky cape of Greece, extending into the Saronic Gulf, at the southern extremity of Attica. The white marble columns of an ancient ruined temple were a famous landmark, visible from far out at sea. The cape, also known as Sunium—derived from its ancient name, Sunium Promontorium—was referred to in Homer's "Odyssey" and in Byron's "Don Juan."

Cape Colony (*ķŏl′ô-ny̆*). See *Cape of Good Hope Province*.

Cape Comorin (*ķŏm′ô-rĭn*), the southern extremity of India, in the state of Kerala.

Comorin Peak, highest elevation in the vicinity, is about 18 m. to the north. At the headland is the town of Cape Comorin, mainly a fishermen's village, but noted for its temple of Kanniyambal.

Cape Diamond (*dī′ȧ-mŭnd*), the extremity of a promontory in Canada, at the junction of the St. Charles and St. Lawrence rivers. It rises about 300 ft. above the river and on it stands the citadel of Quebec. West of it are the Plains of Abraham, where Wolfe with a British force defeated the French under Montcalm in 1759.

Cape Farewell (*fâr′wĕl*), the southern extremity of Greenland, near the entrance to Prince Christian Fjord. The locality is dangerous for navigators on account of the strong currents which flow around Greenland into Davis Strait.

Cape Fear (*fēr*), a cape in North Carolina, at the southern extremity of Smith Island, near the mouth of the Cape Fear River. Currents and breakers make the surrounding waters dangerous to navigation.

Cape Fear River (*fēr rĭv′ẽr*), a river of North Carolina, formed by the Haw and Deep rivers, which unite in Chatham County, near the central part of the state. It has a general course toward the southeast and discharges into the Atlantic Ocean, near Smith Island. The principal towns on its banks are Wilmington, Elizabethtown, and Fayetteville. It is about 200 m. long and is navigable to Fayetteville, about 120 m.

Cape Finisterre (*fĭn-ĭs-târ′*) or LAND'S END, a cape in the northwestern part of Spain, in La Coruña province. Near it were fought two naval battles, in 1747 and 1805, in both of which the English fleet defeated the French.

Cape Flattery (*flăt′ẽr-ĭ*), a cape in the state of Washington, the extreme western point of the U.S. It is located on the Strait of Juan de Fuca, at its southern entrance. About half a mile distant, on Tatoosh Island, is a lighthouse 165 ft. above sea level.

Cape Girardeau (*jĭ-rä[r]′dō*), a city in Cape Girardeau County, Missouri, *ca.* 100 m. S.E. of St. Louis, Mo., on the Mississippi River. It is served by the Frisco and Missouri-Pacific R.R.'s. Situated in fertile farming country, the city has a brisk trade in grain, cotton, livestock, fruit, and dairy products. Manufactures include shoes, electrical appliances, mattresses, limestone products, and dresses. It is the seat of Southeast Missouri State Coll. and St. Vincent's Coll. Population, 1900, 4,815; in 1950, 21,578.

Cape Hatteras (*hăt′ẽr-ăs*), a cape projecting into the Atlantic Ocean from Hatteras Island, N.C. Scourged by frequent storms, with treacherous shoals and currents, the waters off the cape are called the "Graveyard of the Atlantic." The tallest lighthouse in the U.S. (208 ft. high) has operated near the tip of the cape since 1870. Much of Hatteras Island now lies within the Cape Hatteras National Seashore Recreational Area.

Cape Haytien (*hā′shŭn*). See *Cap Haïtien*.

Cape Henlopen (*hĕn-lō′pĕn*), a cape at the south side of the entrance to Delaware Bay, on the coast of Delaware. It is about 12 m. across Delaware Bay to Cape May, N.J. A lighthouse was maintained there until quite recently.

Cape Henry (*hĕn′rĭ*), a cape of the U.S., on the eastern coast of Virginia, at the south entrance to Chesapeake Bay, across which is Cape Charles. It has a sandy beach and a life-saving station. The lighthouse is 164 ft. above sea level.

Cape Horn (*hôrn*), the southern extremity of South America, on Horn Island, Chile, in the Archipelago of Tierra del Fuego. Its headland is a great rock 1,390 ft. high. Sighted by Sir Francis Drake in 1578, the cape and island were named for the town of Hoorn in Holland by Dutch navigators Willem Schouten and Jakob Le Maire, who doubled the cape in 1616. Cape Horn has an antarctic climate and frequent storms, but it was easier to navigate with a sailing ship than the Strait of Magellan.

Čapek (*chä′pĕk*), JOSEF, author and painter, born in Hronov, Bohemia, March 23, 1887; died in Belsen concentration camp, Germany, in March 1945. While regarding himself mainly as a painter, he collaborated with his brother Karel Čapek (*q.v.*) on the writing of short stories and several plays, including "The World We Live In" (1923) and "Adam the Creator" (1929). On his own, he wrote a play, "The Land of Many Names" (1923); a study, "*Kulhavý poutník*" (1936); and "Poems from a Concentration Camp" (published posthumously, 1946).

Čapek, KAREL, journalist and novelist, born in Malé Svatoňovice, Bohemia, on Jan. 9, 1890; died in Prague, Czechoslovakia, on Dec. 25, 1938. Educated in Prague, Berlin, and Paris, he combined the careers of an author and playwright, a theater director, and a journalist. He was a close friend of Thomas Masaryk, first president of Czechoslovakia, and an ardent patriot of the newly created state. His works of fiction, some of which were the result of collaboration with his brother Josef (*see article above*), were often science fantasies, strongly allegorical in tone. During his lifetime, he was best known for his plays, but many critics consider his novels and essays superior. Among his works in English translation are "The Makropoulos Secret" (play, 1922), "R.U.R." (a play, which added the word "*robot*" to the language, 1923). "The World We Live In" (play, 1923), "Krakatit" (novel, 1925), "The Absolute at Large" (novel, 1927), "The Power and the Glory" (play, 1938), his travel essays on England, Italy, Spain, and Holland (1925-33), and his essays on Masaryk.

Cape Lisburne (*lĭz′bẽrn*), a point of land extending into the Chuckchee Sea from the northwestern coast of Alaska. Near it are important coal mines, which furnished fuel for whalers and explorers of the Arctic Ocean. A strong current flows past it from Bering Strait.

Capella (*kȧ-pĕl'ȧ*), a first-magnitude star, the brightest in the constellation of Auriga and the third-brightest in the northern heavens. About 45 light-years away, it is a binary, or double, star. Capella, which means "little she-goat," has been important in Roman mythology.

Cape Lookout (*lo͝ok'owt*), a cape of North Carolina, about 80 m. s.w. of Cape Hatteras. It has a lighthouse about 156 ft. above sea level.

Cape May (*mā*), a point of land in Cape May County, which comprises the southern end of New Jersey, on the northern side of the entrance to Delaware Bay, across from Cape Henlopen on the southern side. There are several towns in the area which derived their names from the cape, including Cape May, Cape May Court House, Cape May Point, and West Cape May. The largest, Cape May, is a popular seaside resort. The Pennsylvania-Reading Seashore Lines serve the area. There are a number of industries, such as fish and oyster canneries, but Cape May is most important as a resort. Cape May diamonds, specimens of pure quartz, are found in the sands. Population (Cape May town), 1940, 2,583; in 1950, 3,607.

Cape Mendocino (*mĕn-dō-sē'nō*), the westernmost point of California, in Humboldt County. It is a high promontory with a lighthouse 422 ft. above the sea.

Cape Nome (*nōm*), a cape on the Seward Peninsula of Alaska, extending into Norton Sound, near the city of Nome. Rich deposits of gold in the sands near the coast precipitated the gold rush to Nome in 1898-99.

Cape of Good Hope (*go͝od hōp*), an important promontory in Africa, just northwest of Cape Agulhas (the southernmost point of the continent) and about 30 m. s. of Cape Town. Forming a peninsula between False Bay and Table Bay, it extends southward from Table Mt. and rises to a height of almost 1,000 ft. above the sea. The Cape of Good Hope was discovered in 1488 by a Portuguese navigator, Bartholomeu Dias (*q.v.*), partly in connection with the search for trade routes to the Far East. Dias rounded the cape, but it was not until later, in 1497-98, that a journey around Africa to India was accomplished by Vasco da Gama. Called the Cape of Storms by Dias, the promontory was renamed (probably by John II of Portugal) because it marked the change of direction in rounding the tip of Africa.

Cape of Good Hope Province, one of the four provinces of the Union of South Africa. On its northern boundary, much of which is formed by the Orange River, are South-West Africa, Bechuanaland, Transvaal, Orange Free State, Basutoland, and Natal. On the s.e. it is bounded by the Indian Ocean, and on the s.w., by the Atlantic Ocean. Walvis Bay, on the western coast of South-West Africa, is included administratively in the province. The total area of the province, excluding the bay, is 278,465 sq. m.

Courtesy Union of South Africa Information Office, N. Y.

CAPE OF GOOD HOPE

The Atlantic and Indian oceans meet at this point

Description. The surface rises from the coastal plain in a fairly definite pattern of alternating mountain ranges and tablelands which increase in elevation toward the high central plateau which covers the interior of most of southern Africa. Over 100,000 sq. m. in area, the plateau has three main sections, the Great Karroo (*ca.* 1,000 ft.-4,000 ft.), in the south central part of the province; the Southern Karroo (*ca.* 1,000 ft.-2,000 ft.), on the southern coast; and the North Karroo (*ca.* 2,000 ft.-4,000 ft.), along the Orange River. The highest mountains in the province are in the northeastern section, with Compass Berg in the Sneeuwberg range the loftiest peak (*ca.* 8,500 ft.). Along the coast and through the mountain ranges are belts of fertile land. The coastal plain has a number of rather shallow bays. On the southern shore is Algoa Bay, the principal inlet. False Bay

Courtesy Union of South Africa Gov't. Information Office, N. Y.

CAPE OF GOOD HOPE PROVINCE. THE OLD SLAVE BELL

and Walkers Bay are near the southern extremity, and St. Helena Bay is in the western part. It may be said that the coast as a whole is regular and characterized by few indentations.

The drainage may be divided into three sections, including the rivers that flow into the Indian Ocean, those that discharge into the Atlantic, and the Orange River and its tributaries. The drainage into the Indian Ocean is by numerous small rivers, none of which is navigable. They include the Breede, Couritz, Gamtoos, Great Fish, and Great Kei. Most of the drainage into the Atlantic is carried by the Olifants River. Among the tributaries of the Orange River are the Hartebeeste and the Ongaars. The plateau of Great Karroo has a number of dry basins in which water gathers at some seasons of the year, and there are no lakes aside from a number of lagoons in the upper course of the Hartebeeste River.

The climate is healthful, being temperate in the southern part and semi-tropical in the northern section. Rainfall is insufficient to produce a large variety of vegetation in the higher regions, but in the moderately elevated sections it is abundant. Irrigation is used extensively for the improvement of lands for cultivation and pastureage, and by means of it large areas have been made productive. Snow covers the higher summits a large part of the year. At Cape Town the average temperature is 65°.

Flora and Fauna. Marked differences in elevation and in the character of the soil account for vegetation being considerably diversified. The coast region has many varieties of useful wood, such as palms, ironwood, and many species of hard timber. The acacia, aloe, and many bulbous plants thrive in the more elevated regions, especially in the vicinity of the Great Karroo. Many species of wild animals were abundant before the territory was occupied by Europeans, including the giraffe, rhinoceros, lion, elephant, and hippopotamus, but all of these have practically disappeared. Those still found include the hyena, jackal, and many species of monkeys. Birds are numerous, and fish are abundant in the streams and off the coast.

Minerals. Mining is an important industry. From 1910 to 1940 the province produced diamonds valued in excess of $1,000,000,000. Kimberley, between the Vaal and Modder Rivers, is the center of the diamond fields. Copper is mined chiefly in Namaqualand, and coal is found abundantly, the principal mines being in the Stromberg Mts. Other minerals include gold, lead, iron,

Courtesy Union of South Africa Gov't. Information Office, N. Y.

CAPE OF GOOD HOPE PROVINCE. VALLEY OF DESOLATION

and salt.

INDUSTRIES. Mining ranks as the chief industry, but much attention is given to mixed agriculture. A large part of the country is well adapted to grazing, hence the rearing of horses, sheep and cattle is carried on extensively. Many large ranches are used in sheep raising, some including 15,000 acres. Considerable revenue is secured from the growing of goats, chiefly the Angora, and mules and swine. Ostriches are also grown for their feathers, although this industry has declined somewhat in recent years. Cereals are cultivated in the regions having sufficient rainfall and where irrigation is possible, and they consist chiefly of wheat, rye, barley, maize, and oats. Tobacco, hay, and fruits are grown profitably.

Manufacturing is limited to the products used in home consumption. They embrace chiefly flour, leather, clothing, tobacco, butter, and spirituous liquors. Transportation is favored by an extensive coast line and by numerous railways in all the sections where settlements are well established. Cape Town, the southern terminus of the Cape-to-Cairo Ry., is important as a seaport and has transportation facilities by rail to Kimberley, Bloemfontein, Johannesburg, and other cities of the interior part of the British possessions in Southern Africa. A number of railways extend inland from the southeastern coast, including lines from East London and Port Elizabeth, the chief seaports on the Indian Ocean. Fewer lines have been constructed in the northwestern section, but connections are made with the interior from Port Nolloth, a seaport on the Atlantic Ocean, about 50 m. s. of the mouth of the Orange River. Foreign trade is largely with Great Britain, other empire ports and the U.S. The export trade is chiefly in minerals, hides, grains and sugar, and the imports are principally foodstuffs, textiles, hardware, and machinery.

Since the formation of the Union of South Africa, the government in the province has been limited to matters of administration such as supervision of public health, maintenance of roads, taxation, education, etc. There are 138 municipalities, each governed by a mayor and a Board of Councillors, in addition to 88 Village Management Boards.

Until 1930 the local and national franchise was restricted to male white property holders; in that year women were allowed to vote, and in the following year the property restriction was removed. The natives are represented by specially elected members of the assembly.

Population. The population includes many Negroid elements, among them the Kafirs, Bechuanas, and other Bantu-speaking groups, and some Hottentots and Bushmen. Most of the Europeans, who make up about one-fourth of the population, are Afrikaners (Dutch, or the descendants of Dutch settlers) and English. One of the serious domestic problems facing the province, and the Union of South Africa, is the deterioration of race relations. The National party, in power since 1948, has favored a policy of apartheid (apartness, or racial segregation).

Cape Town, largest city and capital of the province, and legislative capital of the Union of South Africa, is near its southern extremity on Table Bay. Kimberley, the center of the diamond fields, is near the Orange River, and Port Elizabeth is on Algoa Bay. Other cities of importance are East London and Grahamstown. Population, 1958 est., 4,962,000.

Education. Free education is provided by the province up to the age of 16, and higher education is available at the Univ. of Cape Town (1918), at Rondebosch; the Univ. of Stellenbosch (1918); and at Rhodes Univ. (1951), at Grahamstown.

History. Bartholomeu Dias rounded the Cape of Good Hope in 1488, and when Vasco da Gama completed (1497-99) the sea route to India, the strategic importance of the cape was apparent. In 1652 Jan van Riebeeck founded Cape Town as a supply depot for the Dutch East India Co., which controlled Cape Colony for more than a century. The British occupied it (1795-1803) and annexed it in 1806. In an effort to escape the onerous British rule, the Boers (Dutch) moved north in the Great Trek (1836) into regions now included in Natal, Transvaal, and the Orange Free State. During the 19th century there was a series of wars with the Kafirs and Zulus. In the middle of that century, the colony received a parliamentary form of government; and in 1910 it joined with Natal, Transvaal, and the Orange Free State in the Union of South Africa.

Cape Primrose (*kāp prĭm'rōz*), a herbaceous plant of the family Gesneriaceae grown for its pale purple or blue showy flowers. There are about 60 species in the genus *Streptocarpus*, which fall into three groups: stemless plants with one basal leaf; stemless with a group of basal leaves; stem-bearing species with opposite leaves. They are native to South Africa, Madagascar, and Asia and were first grown in England in 1826 at Kew Gardens. Showy garden hybrids, chiefly varieties of *Streptocarpus kewensis*, are now most commonly grown as greenhouse plants.

Cape Prince of Wales (*prĭns ŭv wālz*), the extreme western point of the North American mainland at the end of the Seward Peninsula, Alaska. It is 55 m. s.e. of East Cape (Cape Dezhnev), Russia, across the Bering Strait, and the closest point to the continent of Asia.

Cape Race (*rās*), a cape at the southeastern extremity of Avalon Peninsula, Newfoundland, extending into the Atlantic Ocean. It is 65 m. s.w. of St. John's.

Caper-bush (*kā'pēr-bŏŏsh*), one of a genus (*Capparis*) of low, trailing, spiny shrubs of the Mediterranean region, belonging to the caper family (Capparidaceae). The best-known member of the genus is *Capparis spinosa*, whose unexpanded flower buds furnish the capers of commerce. The plants are cultivated in southern Europe and southern U.S. The unopened flower buds are picked in the morning and are pickled in salt and strong vinegar. They are used chiefly for flavoring pickles, relishes, and sauces.

Capercaillie (*kăp-ēr-kāl'yĭ*), or CAPERCALLY, or CAPERCAILZIE, a species of grouse native to Europe. The male, sometimes known as cock of the wood or the mountain cock, has dark plumage and a green breast. It is about 34 in. long and weighs 12 lb. The birds live in pine forests, eating the pine needles in winter and berries in summer. A large number inhabit the northern part of Scandinavia, Russia, and the timbered sections of Siberia. They are highly favored for their flesh during most of the year.

Capernaum (*ka-pûr'nā-ŭm*), a Biblical locale in Galilee, west of the Jordan River, on the northwestern shore of the Sea of Galilee. Jesus ministered there after leaving Nazareth (Matthew 4:13), and it was the scene of many of his miracles and discourses (Matthew 11:23; 17:24; Mark 1:21; 2:1; Luke 4:23, 31; John 2:12, 6:59). Nearby is an elevation which is reputed to be the Mount of Beatitudes, scene of the Sermon on the Mount. There are ruins of a synagogue dating from the 1st or 2nd century A.D.

Cape Sable (*sā'b'l*), the name of two capes in North America: (*1*) the southern extremity of Nova Scotia, the southernmost part of Cape Sable Island; (*2*) the southernmost point of Florida and the U.S.

Cape Saint Vincent (*sānt vĭn'sĕnt*), a headland at the southwestern extremity of Portugal and of continental Europe, 118 m. s. of Lisbon. Nearby are the ruins of Prince Henry the Navigator's 15th-century town, possibly the site of his school for navigators and an observatory. Many naval battles were fought offshore.

Cape San Lucas (*săn lōō'kas*), the southernmost point of Lower California, Mexico, and entrance to the Gulf of California. It is a rocky promontory of volcanic origin, almost directly west of Mazatlán, Mexico.

Cape São Roque (*soung rō'kĕ*), a cape in the northeastern part of Brazil, in the state of Rio Grande do Norte, to the north of Natal.

Capetian Dynasty (*ka-pē'shan dĭ'nas-tĭ*), the third dynasty of French kings, which ruled continuously from 987 to 1328. It is commonly said to have been founded by Hugh Capet (*q.v.*), but its historic antecedents go back to Robert the Strong (died in 866), who was marquess of Neustria (*q.v.*). Two of his sons reigned briefly, Eudes, from 887 to 898, and Robert, from 922 to 923. Hugh Capet was elected king after the death of Louis V, the last Carolingian ruler of France, in 987; he secured an orderly succession by making his son, Robert, co-king with him. The most colorful of the later Capetians included Louis VII, Louis IX, and Philip II (*qq.v.*). The last Capetian was Charles IV, who died in 1328, leaving no male heir. His successor was Philip VI, head of the related house of Valois. Other branches of this royal family were the houses of Anjou and Bourbon and the ducal house of Burgundy. During the reign of the Capetians, feudalism reached its height. An important step toward holding together the lands of the crown was the firm establishment of the principle of primogeniture. Contrary to the earlier practice of dividing the kingdom among all male heirs, the Capetians provided for all lands to pass to the eldest son.

Cape-to-Cairo Railway (*cāp-to-kī′rō rāl′-wā*), a line planned to link Cape Town to Cairo. The conception formed part of an imperial dream of Cecil John Rhodes (*q.v.*), wherein he envisaged overland communication between the cities which are 5,000 m. apart. The line, when complete, will be about 7,000 m. long. Progress has been made from Cape Town through the Rhodesias, via Elizabethville in the Belgian Congo to Bukama and Port-Francqui on the Congo. North of Elizabethville a line runs westward to Benguela and Lobito Bay. Cape Town may be reached by rail and navigable waterway from Stanleyville on the Equator, Mombassa and Dar-es-Salaam on the east coast. A line extends south from Alexandria through Cairo to Shellal in Egypt. A stretch of 200 m. of the Nile intervenes to Wadi Halfa whence the line continues via Khartoum to Sennar on the Blue Nile. From Sennar a line runs west to El Obeid and northeast, via Kassala, to Port Sudan on the Red Sea, which also links with Khartoum.

About 2,000 m. of line will have to be constructed to bring Cape Town and Cairo into direct railway communication. Many schemes have been mooted as to the route to be taken, one of which included the use of train ferries on Lakes Tanganyika and Victoria; this implies a new branch line from Broken Hill to the south of Lake Tanganyika, a new line from Tavora to Mwanza, and one from the north of Lake Victoria to Mahagi. Such a route would permit traffic to pass from Cape Town to Cairo solely through British territory or territory administered by Great Britain.

Rail communication is possible between all principal ports of South Africa, including Walvis Bay, Luderitz, Cape Town, Port Elizabeth, East London, Durban, Lourenço Marques and Beira.

Cape Town (*town*), the oldest city in South Africa, at the head of Table Bay, on the north side of the peninsula formed by Table Mt., 30 m. N. of the Cape of Good Hope. It is the seat of the legislature of the Union of South Africa, admin-

CAPE TOWN, UNION OF SOUTH AFRICA

Table Mountain overlooking the city

Courtesy Union of South Africa Gov't. Information Office, N. Y.

istrative center of the Cape of Good Hope Province, and the southern terminus of the Cape-to-Cairo Ry. Architecturally, the town first consisted of flat-roofed, whitewashed shacks. As it grew, the city was replanned, and modern streets and buildings were constructed.

Cape Town is an important seat of commerce and manufactures and is South Africa's chief port. Famous as an exporting point for gold and diamonds, the city also is a thriving market for fruits, wines, skins, wool, mohair, and corn. In addition, Africa's second largest grain elevator is located here. Cape Town was founded by the Dutch in 1651 and was occupied by the British in 1806. The Univ. of Cape Town was established in 1829 as the South African Coll. Population, 1951, 512,822.

Cape Verde (*vĕrd*), a promontory of land, jutting out from the westernmost point of Africa into the Atlantic Ocean, between the Gambia and Senegal rivers, in Senegal, French West Africa. It is the site of the port of Dakar.

Cape Verde Islands, a group of 14 islands of volcanic origin, belonging to Portugal, located about 320 m. w. of Cape Verde, French West Africa. The islands have an area of 1,557 sq. m. The islands are mountainous and have a rich tropical vegetation. The dry, hot climate, relieved by a rainy season extending from August to November, resembles that of the nearby African continent. Coffee, oranges, castor oil, mustard, tobacco, sugar, and hides are the main exports, the major portion of which goes to Portugal. A Portuguese governor resides at Praia, the capital, located on São Tiago. Porto Grande, on São Vincente, is an important coaling station. The islands were discovered by the Portuguese *ca.* 1450 and have since been under their control. Most of the inhabitants are descendants of Portuguese settlers. Racially, half of the population is white, while the other half is composed of Negroes and mulattoes. Population, 1940, 153,800; in 1950, 147,097.

Cape Vincent (*vĭn'sẹnt*), a village of New York, on the St. Lawrence River. It is a center of the Thousand Islands resort area.

Cape York Peninsula (*yôrḳ*), a peninsula in northeastern Queensland, Australia, between the Gulf of Carpentaria and the Coral Sea. It is *ca.* 450 m. long and terminates in Cape York on the Torres Strait.

Capgrave (*ḳăp'grāv*), JOHN, theologian and historian, born in Lynn, Norfolk, England, April 21, 1393; died there, Aug. 12, 1464. One of the most learned men of his time, he spent most of his life as an Augustinian Hermit in a friary at Lynn, where he wrote, among other works, "A Chronicle of England from the Creation to A.D. 1417," which remained unfinished at his death, and *"Nova legenda Angliae,"* the first notable catalogue of lives of English saints.

Cap Haitien (*ḳăp hä'shŭn*), in French, CAP-HAÏTIEN, an important port in northern Haiti and the country's second largest city. It is a marketing center for coffee, cacao, sugar, sisal, and woods. Founded by the French in 1670, it had port facilities which made it the capital of colonial Haiti throughout the next century and the distribution point for sugar grown on the surrounding plantations. The city was also the capital of Henri Christophe, king of Haiti (1811-20). Population, 1950, 24,957.

Capillaries (*ḳăp'ĭ-lĕr-ĭz*), the vessels of hair-like minuteness that form the connections between the extremities of the arteries and the beginning of the veins. The arteries form channels for the blood to pass from the heart and become smaller continuously until they merge into the capillaries, tubes from $\frac{1}{500}$ to $\frac{1}{1000}$ of an inch in diameter. The flow in these small vessels is about $\frac{1}{30}$ of an inch per second in the systemic and $\frac{1}{5}$ of an inch in the pulmonic circulation. The flow is constant, equable, and regular. They fit closely to the veins, which unite into larger and larger channels, as streamlets do to constitute a river, and carry the blood back to the heart. In the capillaries of the lungs, the blood receives oxygen and gives up carbonic acid.

Capillarity (*ḳăp'ĭ-lăr-ĭ-tĭ*), from the Latin *capilla,* meaning hair. The term refers to the tendency of a liquid to flow up into a small tube, or wet a cloth fabric. Water will raise in a narrow glass tube as in *Figure 1,* and so will any liquid that wets the tube. In mercury, which does not wet the glass, the liquid level is lower in the tube than outside (*Figure 2*). The narrower the tube, the greater the rise (or fall) of the liquid in it.

In a piece of cloth the narrow spaces between the threads act like the glass tubes shown in the illustrations, and the water rises in the cloth in the same way. Soapy water wets the cloth more easily, and thus it will rise more quickly.

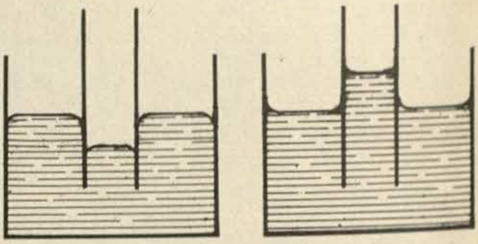


FIGURE 1 FIGURE 2

The wick of a candle, or of an oil lamp, takes up the fuel by capillarity.

Capital (*ḳăp'ĭ-tạl*), in economics, the portion of wealth which is employed for the further production of wealth or that portion of stock (including rights such as patents, etc.) which the owner expects to convert into revenue. Economists usually divide capital into two classes, known as *fixed* and *circulating* capital. Fixed or invested capital is a kind that is used only once in the fulfillment of its purpose, such as machinery. In this form it represents a certain amount of money invested, which will not be used a second time, since the machinery is supposed to be employed in the prosecution of a trade or business until it is worn out and must be replaced by new machinery. Circulating capital undergoes transition from raw material to finished goods, thus serving a certain time for a specified purpose, or a loan made for a definite time.

The nature of modern business enterprises differs very materially from enterprises of society in its primitive state. Then it was thought that each individual should pursue a business and furnish practically all the capital, hence a laborer was skilled to the extent that he could complete almost the entire product without relying upon anyone else. With the invention of modern machinery, capital has become invested very largely in fixed forms, and now the laborer maintains more of a controlling position in the completion of a commercial product. Capital thus utilized leads to the system known as capitalism, which is practiced in almost all countries.

Capitalism is characterized by the private ownership of capital, either in the form of money as stored wealth or in the form of land, buildings, natural resources; in short, any means of production. The use of these elements secures an income as private earnings in free competition. Socialists fight against capitalism, believing that the means for production should be owned by the whole nation, and should not become a private monopoly.

Modern capitalism came into existence gradually through the commercial development which began about the 13th century after the time of the Crusades. The practices of the banker families of the 15th and 16th centuries (the Medici in Italy and the Fuggers in Germany) with their international trade connections, contributed to the further increase of capitalism as did the land discoveries of the 16th and 17th centuries. The most outspoken form of capitalism developed with the industrial revolution of the 19th century when capital assumed the ownership of mills, plants, and the source of necessary raw materials, such as mines. See *Marx, Karl; Money; Political Economy; Socialism.*

Capitalization (*căp-ĭ-tąl-ĭ-zā'shŏn*), in accounting, the total liabilities including outstanding stock of a business; also value of authorized capital stock.

Capital Levy (*kăp'ĭ-tąl lĕv'ȳ*), a tax imposed on personal and corporation capital or property.

Capital Punishment (*pŭn'ĭsh-mẹnt*), in criminal jurisprudence, the infliction of the penalty of death upon conviction of a high crime. In early history it was the mode of punishment for felonies of all kinds, and all primitive people regarded it as the best remedy to induce observance of the law and for the prevention of crimes. A wider study of the causes of crime, including heredity and environment, has led to the conclusion that this mode of punishment is not the best means to overcome criminal conduct, although it is held by all governments that the severity of the punishment of crime should be based upon the nature of the crime committed. The Grecian scholars, Plato and Protagoras, favored the retention of capital punishment on the ground that it tends to deter men from committing the crime of murder, while others maintained positions diametrically opposed to this view. At any rate, this extreme penalty has been opposed by many upon religious and ethical grounds.

Capital punishment was inflicted in early history for desecration of the Sabbath, cursing, idolatry, witchcraft, incest, and disobedience to parents, as well as murder. The Anglo-Saxons made such trivial offenses as robbing a rabbit warren, cutting down a tree or arbor, and offenses against the revenue acts capital crimes, but the theory of law was more severe than the practice. This is seen by the fact that the early laws contained 200 offenses punishable by inflicting this severe penalty, while it was inflicted upon persons guilty of committing only 25 of them. Sir James Mackintosh and others, about 1820, secured a repeal of the early English laws and confined the punishment by death to its present limits.

In Europe capital punishment is prescribed generally for persons guilty of murder, but it is rarely inflicted. The death penalty was abolished in Holland in 1870 and in Rumania and Portugal in 1864, while other countries have followed in the same course toward modifying the penalty for capital crimes. Many countries have laws whereby the form of punishment can be *commuted* to some other form. In Great Britain, Austria, Russia and others execution is by hanging; Spain uses the strangulation method with the garrote; France and Germany behead the victims.

In the U.S., capital punishment may be inflicted for several crimes, including murder, treason, arson, etc., varying with state laws. In some of the states life imprisonment is the severest form of punishment, while in others this form may be substituted by the governor in place of capital punishment. The form of execution is hanging in some states, but in others different methods are used; *e.g.*, lethal gas is used in Arizona, California, Colorado, Missouri, Nevada, North Carolina, Oregon, and Wyoming; New York, Massachusetts, and many other states execute by electrocution. Capital punishment has been abolished in favor of life imprisonment in Maine, Michigan, Minnesota, North Dakota, Rhode Island, Wisconsin, and Puerto Rico. In the armies of the world capital punishment is usually inflicted by shooting or hanging for conviction as a spy or an aggravated form of desertion. Societies have been organized with the object of abolishing capital punishment, claiming that this form often induces crime, while life imprisonment and other severe forms akin to it are much more fruitful in securing obedience to law and regard for the life and property of others.

Capitals (*kăp'ĭ-tạls*), upper-case letters in printing and writing. Languages have peculiarities in the use of capital letters, and in some there is a difference of opinion upon the rules that should govern, hence individual scholars differ in their views as to where to employ them. In English the general rule is to begin all proper names, the first word of every sentence, the first word of each line of poetry, adjectives derived from proper names, and the names of deities with capital letters. The days of the week and of the month, the titles of books, the names of institutions, and the personal pronouns relating to God are capitalized. When an adjective directly precedes the name of a place it is usually capitalized, as Central Europe. Specific events, such as the French Revolution, are capitalized. However, there are differences of opinion for capitalization in English, hence the rules published are numerous and differ very materially. Every noun begins with a capital letter in the German, which was formerly the style used by English writers, and this system has many advantages over those now in vogue in many countries. Such a system simplifies and leaves no question as to propriety in capitalization, the test being in determining the part of speech.

Capitol (*kăp'ĭ-tŭl*), the name applied to the main government building in which the legislative body of a state or nation holds its sessions and the public business is transacted, located at the capital city. The name is from the Roman citadel known as the Capitol, which stood on Capitoline Hill, one of the seven hills of Rome. It was planned by Tarquinius and destroyed during the civil wars in the time of Sulla, but was rebuilt by the senate on a larger plan. It contained an equestrian statue of Marcus Aurelius, the "Capitoline Venus," and "The Dying Gladiator."

In the U.S., each state has a capitol building.

AIR VIEW OF THE CAPITOL AT WASHINGTON, D. C.

Courtesy Ewing Galloway, N. Y.

The national Capitol was originally designed by Dr. William Thornton. Its cornerstone was laid Sept. 18, 1793, at Washington, D.C., by George Washington. In 1800 the north wing was completed, and in 1811 the south wing; both were greatly damaged by the British in 1814. In 1829 the central portion was finished, in 1857 the House Chamber, and in 1859 the Senate Chamber. The length of the entire building is 751 ft.; it is 350 ft. wide and 287 ft. high. It covers three and a half acres. The diameter of the dome is 97 ft., and its height is more than 138 ft. The inside of the Capitol is enhanced by famous historical paintings (*e.g.*, by John Trumbull) and statues. The cost of the entire building was $15,000,000.

Capitoline Hill (*ḳăp'ĭ-tō-līn*), the smallest but the most famous of the seven hills on which ancient Rome was built. The historic and religious center of the pre-Christian era, it was the site of magnificent temples dedicated to Juno Moneta (which became the seat of the Roman mint in 269 B.C.) and of Jupiter Capitolinus, consecrated 509 B.C. (from which the hill derives its name). The medieval Church of Santa Maria in Aracoeli is located on the hill and, according to legend, was built on the spot where Emperor Augustus was told of the birth of Christ by the Sibyl of Tibur. On the Piazza del Campidoglio (Capitol Square), designed by Michelangelo (*q.v.*), are the equestrian statue of Marcus Aurelius (*q.v.*), the Capitoline Museum, built in the 17th century, the Palazzo dei Conservatori (city council chamber), built about 1450 and rebuilt 1564-68 (both housing Greek and Roman works of antiquity), and the Palazzo del Senatore (seat of the present city government).

The *Capitoline Games* were instituted in 387 B.C., but later discontinued. Reinstituted by Emperor Domitian (81-96), they were thereafter held every four years during the existence of the empire.

Capone (*ḳă-pōn'*), ALFONSO, notorious criminal, born in Naples, Italy, in 1897; died in Miami Beach, Fla., Jan. 25, 1947. Reared in New York City, he early became embroiled in organized crime. In Chicago, Ill., to which he moved in 1920, he violated prohibition laws and was involved in murders for which he never stood trial. He terrorized the city's businessmen and politicians until he was indicted for income tax evasion in 1931. After serving eight years of an 11-year prison term he was released.

Cappadocia (*ḳăp-ȧ-dō'shĭ-ȧ*), an ancient district of Asia Minor, most of which is now included in Turkey in Asia, traversed by the Halys River. It was conquered by Cyrus and belonged to Persia. After the time of Alexander the Great, it became an independent kingdom and was ruled as such until 17 A.D., when Tiberius made it a province of Rome. Much is said of this section of Asia Minor in Christian literature, and it is recorded in the first epistle of St. Peter that the Cappadocians were early converts to Christianity.

Capper (*ḳă'pẽr*), ARTHUR, publisher and U.S. Senator; born in Garnett, Kans., July 14, 1865; died in Topeka, Kans., Dec. 19, 1951. He was the owner and publisher of the Topeka *Daily Capital* and the Kansas City *Daily Kansan*. He also published a number of farm papers and served as president of the Board of Regents of Kansas Agricultural Coll. A Republican, he was governor of Kansas (1915-19) and Senator from that state (1919-49). In national politics he supported the isolationist faction and the farm bloc.

Capri (*ḳä'prē*), a famous and beautiful island in the Mediterranean, near the entrance to the Bay of Naples. It is 2 m. wide and 5 m. long, rising to an elevation of 1,900 ft. above the sea. The island is remarkable for its richness in fertile soil, beauty of scenery, historic interest, and ancient ruins. The population engages chiefly in tourist trade and the cultivation of vineyards and orchards. In the western section is the town of Anacapri and in the eastern part is Capri. The history of the island dates back as far as the Stone Age. Julius Caesar and Emperor Tiberius resided on the island for some time during their reigns. Since 1815 the island has been part of Italy. Three grottoes, the Blue, White, and Green, are among the chief attractions. Capri, the capital, has a population of 4,220 and the island, 6,250.

Capricorn (*ḳăp'rĭ-ḳôrn*), the 10th sign of the zodiac (*q.v.*) and the name of a southern constellation. The latter was represented on ancient monuments by the figure of a goat, or as having the fore part of a goat and the hind part of a fish. The ancients celebrated it as the harbinger of success. The two largest stars are of the third magnitude, hence it does not rank as a constellation of much brilliancy. The Tropic of Capricorn the southern boundary of the Torrid Zone, which the rays of the sun are vertical once a yea at noon, usually the 21st day of December.

Caprivi (*ḳä-prē'vē*), GEORG LEO, COUNT VON, statesman, born in Berlin, Germany, Feb. 24, 1831; died in Skyren, Feb. 6, 1899. In 1849 he entered the Prussian army; he served in the war with Austria in 1866 and the war with France in 1870-71, becoming a major general in 1877. He was at the head of the admiralty from 1883 to 1888. In 1890 he was appointed Chancellor of Germany by William II as successor to Prince Bismarck (*q.v.*). He secured the passage of the army bill of 1893, providing for two years' service and an increase in the strength of the army on a war footing to 479,229 men. He resigned the chancellorship because of questions concerning the repression of Socialism, in 1894, and was succeeded by Prince of Hohenlohe-Schillingfürst.

Capsicum (*ḳăp'sĭ-ḳŭm*), a genus of plants native to tropical America, from which four varieties of cayenne pepper are obtained. These plants belong to the nightshade family and are not related to those that yield the real pepper. About 90 species of capsicum have been studied. The leaves are simple and the fruit is a berry with many seeds. The berry in all the species has an inflated appearance, the form being conical, round, or heart-shaped, and the seeds are flattened. A number are cultivated for the extremely pungent and stimulating fruit, which is used in medicine, in making sauces, and in preparing mixed pickles. Cayenne pepper is made from the fruit of several species, chiefly when the berries are ripe, when they have a scarlet or orange color. This product is made principally from *capsicum annuum,* known as chili pepper; it is cultivated in tropical and temperate climates.

Capstan. See *Windlass.*

Capsule (*kăp'sŭl*), in botany, a seed vessel made up of one or more cells, in which the seeds are stored, such as poppy heads. Some capsules break open and discharge their contents, while others fall off entire with the seed. The term is applied in medicine to a small hollow case of gelatin. It is used to inclose medicine so as to permit its being swallowed without coming in contact with the organ of taste. The gelatinous envelope melts when in the stomach, thus setting the medicine free to act.

Captain (*kăp'tĭn*), in the army, an officer in command of a company of infantry, a battery of artillery, or a troop of cavalry. In the U.S. Navy a captain ranks next to a commodore, and his position corresponds to that of a colonel in the army. The term captain general is applied to the commander of the military forces of a province. In this sense the President of the U.S. is the captain general of all the military forces of the nation when in active service. In each state of the U.S. the supreme command of the state troops in times of peace is vested in the governor, who is captain general of the military forces of the state.

Capua (*kăp'ū-à*), a fortified city of Italy, 20 m. N. of Naples, on the Volturno River. It has a cathedral and is the residence of an archbishop. Ancient Capua was about 3 m. S.E. of the modern town, and was long as important as Rome and Carthage. To the Romans it was a favorite place of resort on account of its agreeable climate and beautiful location. It is rich in ancient ruins, among which are those of an amphitheater with a capacity for seating 60,000 people. Capua was founded by the Etruscans in 800 B.C., who named it Volturnum. Genseric with a force of Vandals captured it in 456 A.D., and the Saracens finally destroyed it in 840. Capua became celebrated in literature as the scene of Shakespeare's "Romeo and Juliet." The modern town has a public library, a cathedral, and manufactures of earthenware and clothing. Population, *ca.* 15,000.

Capuchin (*kăp'ū-chĭn*), or RING-TAILED, or SAPAJOU, MONKEY, the most common species (genus, *Cebus*) of tropical America. The most intelligent of the New World monkeys, it is the kind most often seen in captivity. The capuchin is black or brown and often has yellowish areas on the chest, shoulders, and sides of the face. Its body length is about 18 in., and it has a slightly longer tail and long arms. When wild, capuchins travel through the trees, single file, in bands of 30 to 40. They feed on fruits, insects, and birds' eggs.

Capuchins (*kăp'ū-chĭnz*), a religious congregation of the Franciscan order of monks, instituted by Matteo di Bassi in 1525. He desired to practice greater proverty than was required by the strict rule of the order of St. Francis, and his congregation was validated by Clement VII in 1526. The Capuchins were permitted to wear the habit and a beard, and their custom was to live in solitary places and as hermits. Their rules are very strict, requiring them to recite the canonical hours without singing, to spend an hour every morning in mental prayer and in silence, and to partake of the simplest kind of food. In climates and seasons of the year that permit the practice, they are enjoined to go barefooted. These monks are now most numerous in Austria, but they are represented in Canada and the U.S. Bernardino Ochino, converted to Protestantism in 1542, and Theobald Mathew, Irish advocate of total abstinence, are among the best-known Capuchins.

Capulet (*kăp'ū-lĕt*), the family name of Juliet, the heroine of Shakespeare's "Romeo and Juliet."

Capybara (*kăp-ĭ-bä'rà*), a rodent animal of South America, allied to the guinea pig. It has the appearance of a hippopotamus on a small scale, but attains a length of only 3 ft. The legs are short, the head is large, and the hair is coarse and brown. It is tailless. It feeds mainly on vegetation and lives near streams. The flesh is taken for food by the natives, who eat it either fresh or salted. This animal is well distributed throughout the warmer parts of the continent, but is most abundant in Brazil and the Guianas.

Carabinieri (*kä-rä-bē-nyĕ'rē*), Italian state police. Wearing elaborately ornate uniforms, the carabinieri are generally on duty in pairs.

Caracal (*kăr'à-kăl*), a kind of lynx found in Africa and the warmer portions of Asia.

Caracalla (*kăr-à-kăl'là*), MARCUS AURELIUS ANTONINUS, Emperor of Rome, born at Lyons (Lugdunum), France, in 188 A.D.; died in 217. He succeeded his father, Septimius Severus, as Emperor of Rome in 211, and was associated with his brother Geta in the government, but murdered the latter in order to make himself the absolute ruler. In 213 he conducted a military campaign against the Alemanni in Germany and the following year invaded Thrace, where he was assassinated. The baths of Caracalla were built during his reign. They were located on the Appian Way, surrounded by beautiful gardens, and covered an area of about 130,000 sq. yds. Mosaics decorated the floor and fine statuary ornamented the walls, which were strengthened by columns of immense thickness. Water for these baths was obtained through the Marcian aqueduct, and accommodations for 15,000 guests were maintained.

Courtesy Metropolitan Museum of Art, N. Y.

EMPEROR CARACALLA

Marble bust, 3rd cent.

Caracas (*ḳä-rä'ḳäs*), the metropolis and capital of Venezuela, located in a beautiful valley 6 m. from the Caribbean Sea. The site of the city is on the slope of Mount Avila, which attains a height of 8,640 ft., and the city is 3,020 ft., above the tide level. It is connected by a railroad with its seaport, La Guayra, about 8 m. distant. Its altitude brings it within an equable temperature and healthful air. It is the seat of a school system for free attendance, and articulated with its courses are a number of professional colleges, technical schools, and the Univ. of Caracas. The capitol building is a large and beautiful structure, and besides it there are federal buildings, the president's residence, several cathedrals, and the Basilica of St. Ann. Several public parks, gardens and promenades are maintained. The gardens and parks contain many rare and beautiful plants, and collections of wild animals. It has a growing import and export trade, the latter consisting chiefly of coffee, cacao, and tobacco. Caracas was founded in 1567. Population, *ca.* 100,000.

Caracci (*ḳä-rät'chē*), or CARRACCI, a family of Italian painters, founders of the Bolognese school of painting, which flourished in the latter half of the 16th century. Ludovico Caracci was born at Bologna in 1555, and died there in 1619. He studied at Venice and Parma, where he was introduced to the works of the great masters, and returned to his native city. He founded a school which attracted many students and which became famous for its exquisite drawings and paintings.

Caracci, AGOSTINO, cousin of Ludovico, born in Bologna in 1558; died in 1601. He attained much skill as an engraver, and besides being an excellent teacher was also a well-known painter.

Caracci, ANNIBALE, brother of Agostino, born in Bologna in 1560; died in Rome in 1609. He studied under his cousin and later at Venice and Parma.

Great religious paintings were made by all three of the Caracci, and Annibale and Agostino shared in the monumental frescoes decorating the gallery of the Farnese Palace, Rome (1600-05). These paintings show clearly the main tendency followed by the Caracci and their school, the so-called Eclectic school, having as its main principle an incorporation of the art of the great masters. Thus, they took from Michelangelo the power and strength, from the school of Raphael the delicacy of design, and used the Venetians as the inspiration for their colors. The Caracci represented a movement against the art of Caravaggio and his followers. While Caravaggio stressed naturalistic phenomena, the Caracci adhered to classical interpretations. Nevertheless, both trends are clearly representative of the art of the Baroque.

VIEW OF CARACAS, VENEZUELA

Statue of Christopher Columbus in the foreground

Courtesy Grace Line, N. Y.

Caraccioli (*ķȧ-rät′chô-lê*), FRANCESCO, prince and admiral, born in Naples, Italy, in 1748; executed June 29, 1799. At an early age he entered the marine service. He first distinguished himself at Toulon in 1793 and five years later conducted operations against the Sicilian-English fleet. He was arrested in 1799, when Ruffo took Naples, contrary to the terms of capitulation, condemned and hanged. The fact that this unjust proceeding was approved by Lord Nelson is sometimes considered the most severe stain on the reputation of the English admiral.

Caramel (*ķăr′ȧ-mĕl*), a hard although plastic candy made out of sugar, milk products, and fats, and sometimes fruits and nuts. The finished candies appear in the form of small cubes or squares. Caramel as a commercial product for coloring or flavoring results from the application of heat to glucose or molasses and the addition of a little ammonia or other alkali.

Carat (*ķăr′ạt*), a weight equal to the twenty-fourth part of an ounce, or three and one-fifth grains Troy. Jewelers use the term to express the fineness of gold; the whole mass is represented by 24 parts, the numbers of parts taken expressing so many twenty-fourths. Pure gold is 24 carats; 18 carats, three-fourths gold; 12 carats, one-half gold, etc. Fine gold consists of two parts alloy and 22 of pure gold. The gold coinage of the U.S. is in these proportions. The double eagle ($20 gold piece) weighs 516 grains, of which 464.4 grains are fine gold.

Caravaggio (*ķä-rä-väd′jô*), MICHELANGELO DA, originally MICHELANGELO MERISI, painter, born in Caravaggio, near Bergamo, Italy, in 1569(?); died in Porte d'Ercole in 1609. Apprenticed to an artist in Milan while still a boy, he may also have studied in Venice before going to Rome (*ca.* 1590), where he soon distinguished himself for his individualistic painting style as well as for his brawling. Held for criminal action more than once, he was forced to flee a murder charge in Rome in 1606 and spent time in Naples, Sicily, and Malta before he died of malaria. The founder of a naturalistic school which greatly influenced 17th-century painting, he produced work of great dramatic power, with startling contrasts in light and shade and an expressive handling of space. His best-known pictures include "Death of the Virgin" (Louvre), "The Entombment" (Vatican), "Martyrdom of St. Sebastian" (Roman Capitol), and "The Supper at Emmaus" (National Gallery, London).

Caravan (*ķăr′ạ-văn*), a body of travelers or traders banded together for safety and convenience in journeying through unsettled or hazardous country. The term caravan is Persian in origin and is historically associated with travel on the overland trade routes in Asia and Africa that were crucial links between many early centers of civilization. Camels were the common beasts of burden, with as many as 1,000 harnessed in lines forming a single caravan. Religious pilgrimages to Mecca by groups of Mohammedans (which are more correctly called hadj) are often referred to as caravans.

Courtesy Nat'l. Gallery of Art, Kress Collection, Wash., D. C.

STILL LIFE. PAINTING BY CARAVAGGIO